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To Mr M B Parnall,
April 26, 1963

ONTARIO

DEPARTMENT OF EDUCATION

VISUAL EDUCATION CATALOGUE

SUPPLEMENT — 1963

To Be Used with the Visual Education Catalogue, 1961

Issued by Authority of
The Minister of Education

This Supplement should be used in conjunction with the Visual Education Catalogue, 1961. Schools are advised to select the majority of their film choices from the 1961 catalogue.

ONTARIO

DEPARTMENT OF EDUCATION

VISUAL EDUCATION CATALOGUE

SUPPLEMENT — 1963

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Classified Lists of Films According to Subject Areas

NOTES

1. All films are sound films. Do not run any of these films on a silent projector.
2. All films are black and white, except those with the word "colour" added in brackets.
3. The revised curriculum provides for four Divisions. The following abbreviations will be used to indicate the Division where each film can be used most effectively.

	Abbrev.
Primary Division—Grades 1 to 3	Pr.
Junior Division—Grades 4 to 6	Jr.
Intermediate Division—Grades 7 to 10	Int.
Senior Division—Grades 11 to 13	Sr.

Call No.	Film Title	Producer	No. of Reels	Curr. Division
	ART			
A-84	Art and You (Colour)	F.A.C.	1	Int. Sr.
A-85	Carvaggio and Baroque (Colour)	McG. H.	1½	Sr.
A-86	Collage: Exploring Texture (Colour)	I.F.B.	1¼	Pr. Jr.
A-87	Design Into Space (Colour)	I.F.B.	1	Int.
A-88	Design With Paper (Colour)	I.F.B.	1	Int.
A-89	Discovering Colour (Colour)	F.A.C.	1½	Int. Sr.
A-90	Discovering Perspective (Colour)	F.A.C.	1½	Jr. Int. Sr.
A-91	Discovering Texture (Colour)	F.A.C.	1½	Int. Sr.
A-92	Line and Art (Colour)	Thorne	1	Int.
A-93	What Shall We Paint (Colour)	F.A.C.	1	Pr. Jr.
	ENGLISH			
E-90	Hamlet: The Age of Elizabeth (Colour)	E.B.	3	Sr.
E-91	Hamlet: What Happens in Hamlet (Colour)	E.B.	3	Sr.
E-92	Hamlet: The Poisoned Kingdom (Colour)	E.B.	3	Sr.

Call No.	Film Title	Producer	No. of Reels	Curr. Division
E-93	Hamlet: The Readiness is All (Colour)	E.B.	3	Sr.
E-94	Morning on the Lievre (Colour)	N.F.B.	1¼	Sr.
E-95	The Novel: What It Is (Colour)	E.B.	3¼	Sr.
E-96	The Novel: Early Victorian England and Charles Dickens (Colour)	E.B.	3¼	Sr.
E-97	The Novel: Great Expectations —Part 1 (Colour)	E.B.	3¼	Sr.
E-98	The Novel: Great Expectations —Part II (Colour)	E.B.	3¼	Sr.
E-99	Parts of Speech (Colour)	Coronet	1¼	Jr.
E-100	Story of a Book (Colour)	C.W.	1	Jr.
E-101	Thumbelina	Primrose	1	Pr. Jr.
E-102	Woody Woodchuck's Adventure (Colour)	E.B.	1	Pr.
	GUIDANCE			
G-101	You Can Go A Long Way	N.F.B.	2	Int. Sr.
	HEALTH AND SAFETY			
H-105	It's Best To Know	Alc. Research	1	Sr.
H-106	Muscles and Bones of the Body (Colour)	Coronet	1	Int. Sr.
H-107	Rescue Breathing	Amer. Film Production	2	Int. Sr.
	HOME ECONOMICS			
HE-26	Flaxen Heritage (Colour)	Singleton	1½	Int. Sr.
HE-27	Tips for Tables (Colour)	Singleton	1¼	Int. Sr.
	INDUSTRIAL ARTS			
IA-11	Office Courtesy (Colour)	E.B.	1½	Int.
IA-12	Office Etiquette	E.B.	1¼	Int.
IA-13	Office Teamwork (Colour)	E.B.	1½	Int.
	LANGUAGE			
L-8	Tan-Gau Method, The (Colour)	C.E.C.	3	Jr. Int.

Call No.	Film Title	Producer	No. of Reels	Curr. Division
	PHYSICAL EDUCATION			
PE-76	Lawn Tennis—Instruction at Wimbledon Part I	C.F.I.	2	Int. Sr.
PE-77	Lawn Tennis—Instruction at Wimbledon Part II	C.F.I.	2	Int. Sr.
PE-78	Tennis, Beginning	C.F.I.	1¼	Int.
PE-79	Track and Field: Broad Jump	Ryan	1½	Int. Sr.
PE-80	Track and Field: Discus	Ryan	1½	Int. Sr.
PE-81	Track and Field: High Jump	Ryan	1½	Int. Sr.
PE-82	Track and Field: Hurdles	Ryan	1½	Int. Sr.
PE-83	Track and Field: Pole Vault	Ryan	1½	Int. Sr.
PE-84	Track and Field: Shot Put	Ryan	1½	Int. Sr.
	SCIENCE - BIOLOGY			
SB-38	Arthropods: Insects and Their Relatives (Colour)	Coronet	1	Int. Sr.
SB-39	Around a Big Lake (Colour)	I.F.B.	1¾	Int. Sr.
SB-40	Biology in Today's World (Colour)	Coronet	1	Int. Sr.
SB-41	Hibernation and Other Forms of Dormancy (Colour)	E.B.	1	Int. Sr.
SB-42	Life in the Desert (Colour)	E.B.	1	Int. Sr.

BIOLOGY SERIES

This is an Encyclopaedia Britannica film series, recommended for use at the Intermediate-Senior grade level.

Code No.		No. of Reels
B-15	Adaptive Radiation — The Mollusks (Colour)	1¾
B-13	Angiosperms — The Flowering Plants (Colour)	1½
B-28	Blood (Colour)	1½
B-2	Cave Community (Colour)	1¼
B-16	Chick Embryo: From Primitive Streak to Hatching (Colour)	1¼
B-3	Community (Colour)	1
B-4	Desert (Colour)	2
B-29	DNA: Molecule of Heredity (Colour)	1½
B-17	Echinoderms — Sea Stars and Their Relatives (Colour)	1¾
B-18	First Many-Celled Animals — Sponges (Colour)	1½
B-27	Fundamentals of the Nervous System (Colour)	1½
B-10	Fungi (Colour)	1½

B-5	Grasslands (Colour)	1½
B-12	Gymnosperms (Colour)	1½
B-6	High Arctic Biome (Colour)	2
B-21	Joint Legged Animals — Arthropods (Colour)	1½
B-30	Mitosis (Colour)	2
B-11	Seed Germination (Colour)	1¼
B-23	Segmentation — The Annelid Worms (Colour)	1½
B-14	Simple Plants — The Algae (Colour)	1½
B-19	Single Celled Animals — Protozoa (Colour)	1½
B-22	Social Insects: The Honeybee (Colour)	2¼
B-20	Stinging Celled Animals — Coelenterates (Colour)	1½
B-7	Succession — From Sand Dune to Forest (Colour)	1½
B-8	Temperate Deciduous Forest (Colour)	1½
B-9	Tropical Rain Forest (Colour)	1½
B-24	What is an Amphibian? (Colour)	1
B-25	What is a Bird? (Colour)	1½
B-26	What is a Reptile? (Colour)	1¾
B-1	What is Ecology (Colour)	1

Call No.	Film Title	Producer	No. of Reels	Curr. Division
	SCIENCE — CHEMISTRY			
SC-20	Chemical Changes (Colour)	McG. H.	1½	Sr.
SC-21	Nitrogen and Living Things (Colour)	U.W.	1¼	Sr.
SC-22	Story of Heat (Colour)	U.W.	1¼	Sr.

CHEMISTRY SERIES

This is an Encyclopaedia Britannica Film series with each film being one half hour in length. Recommended for use at the Senior grade level. All films are in colour.

C-1	Introduction (Chemistry Series)
C-2	Classifying Matter — The Need
C-3	The Physical States of Matter
C-4	Classifying Matter — A Method
C-5	Atoms and Molecules
C-6	A Chemical Reaction and Its Equation
C-7	Combustion — Molecules in Action
C-8	Atoms and Their Weights
C-9	Oxygen: The Earth's Most Abundant Element
C-10	Molecules and Their Weights
C-11	Weighing — The Analytical Balance

C-12 The Mole Concept
C-13 Using the Mole Concept
C-14 The Empirical Formula of a Compound:
C-15 Brief Review, Lessons 1-14 and a First Look at Hydrogen
C-16 Mole and Weight Relationships in Chemical Reactions
C-17 Laws of Stoichiometry and the Atomic Theory
C-18 Introduction to Gas Behavior
C-19 Gas Pressure: Origin and Measurement
C-20 Partial Pressures: Boyle's Law
C-21 The "Gas" Temperature Scale: Absolute Zero
C-22 Gas Law Calculations — How Errors Arise in Experiments
C-23 Speeds of Molecules — Gaseous Diffusion
C-24 Standard Temperature and Pressure — Gas Density and Molar Volume
C-25 Determination of Molecular Weights of Gases
C-26 Formulas: Empirical and Molecular Using Molar Volumes
C-27 Determination of Molecular Weights of Liquids and Solids
C-28 Number-Weight-Volume Relationships — A Review
C-29 A First Look at Atomic Structure
C-30 The Nucleus and the Neutral Atom
C-31 Electronic Arrangements — The Inert Gases
C-32 The Formation of Ionic Compounds
C-33 Ionic Compounds and Ionic Binding
C-34 Covalent Binding
C-35 Ionic and Covalent Binding Contrasted
C-36 Water, Its Structure. Polar Molecules
C-37 Water: Some of Its Properties
C-38 Water: Its Peculiar Properties — Table Salt: Its Structure
C-39 Ionic Compounds and Electrical Conductivity
C-40 Ionic Compounds Continued Precipitation
C-41 How Salts Dissolve in Water
C-42 Hydrogen Chloride. Preparation and Properties
C-43 Acids and Bases. An Introduction
C-44 Developing An Acid-Base Theory
C-45 A Typical Acid-Base Reaction-Indicators
C-46 Relative Strength of Acids and Bases
C-47 Construction of an Acid-Base Table
C-48 Using an Acid-Base Table
C-49 Making Solutions of Known Concentration
C-50 An Acid-Base Titration
C-51 Titration of a Weak Acid-Calculations
C-52 Dynamic Equilibrium
C-53 Chemical Equilibrium — A Typical Weak Acid
C-54 A Summary of Equilibrium Principles

C-55 The Le Chatelier Principle
C-56 Applications of the Le Chatelier Principle
C-57 The pH Scale
C-58 Buffer Solutions Review
C-59 Thermochemistry Temperature and Reaction Extents
C-60 Rates of Chemical Reactions
C-61 Temperature Reaction Rates and Reaction Extents
C-62 Laboratory Techniques and Apparatus — I
C-63 Laboratory Techniques and Apparatus — II
C-64 Covalent Binding — A Review — Its Geometry
C-65 Carbon
C-66 Multiplicity of Carbon Compounds
C-67 Geometry of Carbon Compounds — Isomerism
C-68 Alkanes — The Saturated Hydrocarbons
C-69 Petroleum
C-70 Gasoline and Motor Fuels
C-71 Alkenes and Alkynes — The Unsaturated Hydrocarbons
C-72 Alcohols
C-73 Compounds Containing the Carbonyl Group
C-74 Organic Compounds Containing Nitrogen
C-75 Dyes — Some Principles of Organic Synthesis
C-76 Synthetic Polymers I
C-77 Synthetic Polymers II
C-78 Natural Polymers — Carbohydrates and Proteins
C-79 Biochemistry — A General View
C-80 Carbohydrates and Fats
C-81 Proteins — Enzymes
C-82 Chemical Reactions in Higher Plants
C-83 Chemical Reactions in the Animal Body
C-84 Some Typical Biochemical Laboratory Tests
C-85 Structural Properties of Simple Ions
C-86 Reactivities of Atoms and The Periodic Table
C-87 A Family of Elements — The Alkali Metals
C-88 The Alkali Metals — Oxidation-Reduction
C-89 The Alkaline Earth Metals
C-90 Groups IA and IIA Compared
C-91 Soluble and Insoluble Salts
C-92 Precipitation Reactions
C-93 Equilibrium in Saturated Solutions of Salts — Calcium Carbonate
C-94 The Chemistry of Lime
C-95 Hard Water — Its Formation
C-96 Hard Water — Its Treatment Ion Exchange
C-97 Precipitation and Inorganic Synthesis
C-98 Washing Soda, Soap and Synthetic Detergents

C-99 The Chemistry of Sodium Bicarbonate
C-100 The Ammonia Soda Process
C-101 Experiments With Acidic Cations
C-102 Introduction To Ion Hydration
C-103 Colours of Aquo Complex Ions — Coordination Number
C-104 Relating Structural and Chemical Properties — An Example
C-105 Gelatinous Hydroxides Amphoterism
C-106 The Transition Metals — An Introduction
C-107 Experiments With Some Typical Transition Metal Ions
C-108 Some Complex Ions of the Transition Metals
C-109 Some Applications of Complexing Reactions
C-110 Some Aspects of Complex Ion Theory
C-111 A Review of Valence Concepts — Oxidation Number
C-112 Oxidation Number and the Naming of Compounds
C-113 An Introduction to Oxidation and Reduction
C-114 Building and Oxidation Reduction Table
C-115 A Typical Electric Cell
C-116 Electric Cells and the Faraday Laws
C-117 Equivalent Weights of Metals
C-118 The Lead Storage Battery — The Dry Cell
C-119 Some Chemical Experiments With a Daniell Cell
C-120 Oxidation-Reduction Equations
C-121 The Copper-Silver Ion Reaction — A Quantitative Experiment
C-122 Electrolysis I
C-123 Electrolysis II
C-124 Types of Reactions — A Summary and Review
C-125 The Halogens
C-126 Chlorine
C-127 Fluorine, Bromine and Iodine
C-128 Halogen Chemistry — A Summary
C-129 Laboratory Experiments With Halide Ions — Observations and Inferences
C-130 The Sulfur Family
C-131 Hydrogen Sulfide — Metal Sulfides
C-132 Sulfur Oxides — Sulfuric Acid
C-133 Nitrogen — Ammonia and Nitric Acid
C-134 Phosphorus and Its Compounds
C-135 Silicon, Silica, and Silicates
C-136 Some Applications of Silicate Chemistry
C-137 Metals and Metallurgy I — Some Native Metals
C-138 Metals and Metallurgy II — The Moderately Reactive Metals

C-139 Metals and Metallurgy III — The Very Reactive Metals
C-140 Iron
C-141 Steel — Alloys
C-142 Iron — Solution Chemistry I
C-143 Iron — Solution Chemistry II
C-144 Iron — Corrosion
C-145 The Packing of Spheres — Simple Solid Structures
C-146 Measuring the Size of a Molecule — An Experiment
C-147 Units, Significant Figures — Large and Small Numbers
C-148 Determining Structures — A Simple Approach
C-149 Radioactivity and Radiochemistry I
C-150 Radioactivity and Radiochemistry II
C-151 The Chemistry of Photography
C-152 Planning a Career — Courses, College, Chemistry
C-153 Chemists At Work I
C-154 Chemists At Work II — Some Special Instruments
C-155 Colloids
C-156 Qualitative Analysis I — Introduction, Tests
C-157 Qualitative Analysis II — Separations
C-158 Qualitative Analysis III — Lead (I) Silver (I) and Mercury (I) Ions
C-159 Qualitative Analysis IV — Aluminum (III) Chromium (III) and Iron (III) Ions
C-160 Summary — What of the Future?

Call No.	Film Title	Producer	No. of Reels	Curr. Division
	SCIENCE — GENERAL			
SG-116	Birth and Death of Mountains (Colour)	F.A.C.	1	Int. Sr.
SG-117	Building a Jet Plane (Colour)	F.A.C.	1	Jr.
SG-118	Caverns and Geysers (Colour)	F.A.C.	1½	Int. Sr.
SG-119	Compass, The	McG. H.	1¼	Jr.
SG-120	Earth In Change (Colour)	E.B.	1½	Jr. Int.
SG-121	Electro-magnets (Colour)	McG. H.	1	Pr. Jr.
SG-122	Fire Science	C.W.	1½	Jr. Int.
SG-123	First Men Into Space (Colour)	E.B.	1½	Int.
SG-124	Friction and Its Effects (Colour)	Coronet	1	Int.
SG-125	Learning About Light	E.B.	¾	Jr. Int.
SG-126	Learning About Sound	E.B.	¾	Jr. Int.
SG-127	Our World of Science	E.B.	1	Jr. Int.
SG-128	Story of Magnetism (Colour)	Carman	1½	Jr. Int.

Call No.	Film Title	Producer	No. of Reels	Curr. Division
SG-129	Volume and Its Measurement (Colour)	Coronet	1	Int.
SG-130	What Is So Important About a Wheel (Colour)	Journal	1	Pr. Jr.
SG-131	What Makes Day and Night	McG. H.	1	Pr. Jr.
SG-132	Which Way Is North (Colour)	E.B.	1½	Int.
SG-133	You and Machines (Colour)	Carman	1½	Jr. Int.

SCIENCE — NATURAL

SN-206	Animals of Pre-Historic America (Colour)	McG. H.	1	Pr. Jr.
SN-207	Animals Protect Themselves (Colour)	Coronet	1¼	Jr. Int.
SN-208	Animals See In Many Ways (Colour)	F.A.C.	1¼	Pr. Jr.
SN-209	Big Green Caterpillar, The (Colour)	Stanton	1	Pr. Jr.
SN-210	Birds and Their Characteristics (Colour)	Coronet	1	Int.
SN-211	Fall Brings Changes (Colour)	C.W.	1	Pr. Jr.
SN-212	Fish and Their Characteristics (Colour)	Coronet	1	Int.
SN-213	How Sunshine Helps Us (Colour)	Coronet	1	Pr.
SN-214	Introducing Insects (Colour)	N.F.B.	2	Jr. Int.
SN-215	Living Mammals, The	Deusing	1¾	Int.
SN- 216	Mother Cat and Her Baby Skunks (Colour)	E.B.	1	Pr. Jr.
SN-217	Pond, The (Colour)	I.F.B.	1¾	Jr. Int.
SN-218	Spring Brings Changes (Colour)	C.W.	1	Pr. Jr.
SN-219	Water and What It Does (Colour)	E.B.	1	Int.
SN-220	We Explore the Field and Meadow (Colour)	Coronet	1	Pr. Jr.
SN-221	What Do We See In the Sky (Colour)	Coronet	1	Pr.
SN-222	What's Alive? (Colour)	F.A.C.	1	Pr.
SN-223	Woodcock (Colour)	I.F.B.	½	Pr. Jr.

PHYSICS SERIES

This is an Encyclopaedia Britannica film series with each film being one half hour in length, recommended for use at the Senior grade level.

P-1 Physics, an Exact Science — Lecture (Colour)
P-2 Optical Illusions — Lecture (Colour)
P-3 Units of Measurements — Lecture
P-4 Measurement of Distances and Angles (laboratory)
P-5 Slide Rule
P-6 Algebra and Powers of Ten
P-7 Trigonometry
P-8 Speed and Velocity — Lecture
P-9 Speed and Velocity (laboratory)
P-10 Accelerated Motion — Lecture (Colour)
P-11 Accelerated Motion (laboratory)
P-12 Composition of Velocities — Lecture
P-13 Resolution of Velocities — Lecture
P-14 Falling Bodies — Lecture
P-15 Falling Bodies (laboratory)
P-16 Newton's First Law of Motion — Lecture (Colour)
P-17 Projectiles — Lecture (Colour)
P-18 Projectiles (laboratory)
P-19 Newton's Second Law of Motion — Lecture
P-20 The Force Equation (laboratory)
P-21 Newton's Law of Gravitation and Third Law of Motion — Lecture (Colour)
P-22 Balanced and Unbalanced Forces — Lecture
P-23 Concurrent Forces (laboratory)
P-24 Resolution of Forces — Lecture
P-25 Resolution of Forces (laboratory)
P-26 Rotational Equilibrium — Lecture
P-27 Parallel Forces (laboratory)
P-28 Centre of Mass and Centre of Gravity — Lecture (Colour)
P-29 The Simple Crane (laboratory)
P-30 Equilibrium of Rigid Bodies — Lecture
P-31 Friction — Lecture
P-32 Coefficient Friction (laboratory)
P-33 Streamlining — Lecture
P-34 Work and Energy — Lecture
P-35 Centre of Gravity (laboratory)
P-36 Energy and Power — Lecture
P-37 Horsepower (laboratory)
P-38 Conservation of Energy — Lecture

P-39 Conservation of Momentum — Lecture
P-40 Energy and Momentum — Lecture
P-41 Levers — Lecture
P-42 Levers (laboratory)
P-43 Anatomical Mechanics — Lecture
P-44 Machines — Lecture
P-45 Ballistics (laboratory)
P-46 Circular Motion — Lecture
P-47 Centripetal Force (laboratory)
P-48 Dynamics of Rotation — Lecture
P-49 Conservation of Angular Momentum — Lecture
P-50 Moment of Inertia (laboratory)
P-51 Atomic Theory of Matter — Lecture (Colour)
P-52 Elasticity (Stress, Strain, Young Modulus) — Lecture
P-53 Hooke's Law (laboratory)
P-54 Bending, Twisting, and Bouncing — Lecture (Colour)
P-55 Pressure in a Liquid — Lecture
P-56 Pressure in Liquids (laboratory)
P-57 Archimedes' Principle — Lecture
P-58 Density and Weight Density (laboratory)
P-59 Surface Tension — Lecture
P-60 The Atmosphere — Lecture
P-61 Weighing the Air (laboratory)
P-62 Fluids in Motion — Lecture
P-63 Fluid Friction (laboratory)
P-64 Bernoulli's Principle — Lecture (Colour)
P-65 Vibrations and Waves — Lecture
P-66 The Pendulum (laboratory)
P-67 Temperature and Expansion — Lecture
P-68 Thermal Expansion (laboratory)
P-69 Heat Capacity and Change of State — Lecture
P-70 Heat Transfer — Lecture (Colour)
P-71 Specific Heat (laboratory)
P-72 Radiant Heat — Lecture
P-73 Latent Heat of Fusion (laboratory)
P-74 Change of State — Lecture
P-75 Refrigeration and Geysers — Lecture (Colour)
P-76 Newton's Law of Cooling (laboratory)
P-77 Heat Energy and Gas Laws — Lecture
P-78 Mechanical Equivalent of Heat (laboratory)
P-79 Liquid Air — Lecture (Colour)
P-80 Heat Engines — Lecture
P-81 Boyle's Law (laboratory)
P-82 Sound Waves — Lecture
P-83 Frequency of Tuning Fork (laboratory)

P-84 Resonance, Beats and Doppler Effect — Lecture
P-85 Vibrating Strings (laboratory)
P-86 Vibrating Strings and Air Columns — Lecture (Colour)
P-87 Wind and Percussion Instruments — Lecture
P-88 Resonating Air Columns (laboratory)
P-89 Sound Energy and Hearing — Lecture
P-90 The Science of the Musical Scale — Lecture (Colour)
P-91 Speed of Sound (laboratory)
P-92 The Quality of Musical Sounds — Lecture
P-93 The Nature of Light — Lecture (Colour)
P-94 Light Sources and Illumination — Lecture (Colour)
P-95 Photometry (laboratory) (Colour)
P-96 Reflection from Plane Surfaces (lecture) (Colour)
P-97 Reflection from Plane Surfaces (laboratory) (Colour)
P-98 Reflection from Curved Surfaces — Lecture (Colour)
P-99 Refraction of Light — Lecture (Colour)
P-100 Index of Refraction (laboratory) (Colour)
P-101 Lenses — Lecture (Colour)
P-102 Study of Lenses (laboratory) (Colour)
P-103 Dispersion Lecture (Colour)
P-104 Colour — Lecture (Colour)
P-105 Magnifying Power of a Lens (laboratory) (Colour)
P-106 The Eye and Optical Instruments — Lecture (Colour)
P-107 Principles of the Microscope (laboratory) (Colour)
P-108 Diffraction and Interference — Lecture (Colour)
P-109 Polarization of Light — Lecture (Colour)
P-110 Rainbows, Blue Skies and Red Sunsets — Lecture (Colour)
P-111 Electricity at Rest — Lecture
P-112 Coulomb's Law — Electrostatics — Lecture
P-113 Electricity in Motion — Lecture (Colour)
P-114 Electromotive Force of a Battery Cell (laboratory)
P-115 Ohm's Law — Lecture
P-116 Series Circuits (laboratory) (Colour)
P-117 Parallel Circuits — Lecture
P-118 The Electric Field and Potential — Lecture
P-119 Parallel Resistances (laboratory) (Colour)
P-120 Capacitance — Lecture
P-121 The Potential Divider (laboratory)
P-122 Magnetism — Lecture
P-123 Magnetic Fields — Lecture (Colour)
P-124 Wheatstone Bridge (laboratory)
P-125 Effects of Electric Currents — Lecture
P-126 Electric Equivalent of Heat (laboratory)
P-127 Electric Motors — Lecture
P-128 Magnetic Induction — Lecture

P-129	A Study of Motors (laboratory)
P-130	Induced Electric Currents — Lecture
P-131	Coulomb's Law — Magnetism (laboratory)
P-132	Transformers — Lecture
P-133	Alternating Current Theory — Lecture
P-134	Transformers (laboratory)
P-135	Discovery of the Electron — Lecture
P-136	Electronic Charge and Mass — Lecture
P-137	The Elements and Their Isotopes — Lecture
P-138	Electronic Charge to Mass Ratio (laboratory)
P-139	Light Sources and Their Spectra — Lecture (Colour)
P-140	Wave Lengths of Spectrum Lines (laboratory)
P-141	X-rays — Lecture (Colour)
P-142	Radioactivity — Lecture
P-143	Radioactivity Measurements (laboratory)
P-144	Electromagnetic Waves — Lecture
P-145	Vacuum Tubes — Lecture (Colour)
P-146	Characteristics of Vacuum Tubes (laboratory)
P-147	Oscillators, Amplifiers, and Radio — Lecture
P-148	The Photoelectric Effect — Lecture (Colour)
P-149	Electromagnet Waves (laboratory)
P-150	Radar and TV — Lecture
P-151	Geiger-Mueller and Scintillation Counters (laboratory)
P-152	The Bohr Atom — Lecture
P-153	Electron Shell Structure — Lecture
P-154	Photon Collisions and Atomic Waves — Lecture
P-155	Electron Optics — Lecture
P-156	Nuclear Disintegration — Lecture
P-157	Cosmic Rays — Lecture
P-158	Atomic Accelerators — Lecture (Colour)
P-159	Radiation Measurements (laboratory)
P-160	Transmutation — Lecture (Colour)
P-161	Inside the Nucleus and Fission — Lecture (Colour)
P-162	Nuclear Energy — Lecture (Colour)

SPACE AGE

This is an Encyclopaedia Britannica film series, recommended for use at the Intermediate-Senior grade level.

Call No.		No. of Reels
S-15	Atomic Energy — Inside the Atom (Colour)	1¼
S-14	Electrons at Work (Colour)	1¼
S-5	Energy and Work (Colour)	1
S-13	Evidence For Molecules and Atoms (Colour)	1½
S-3	Forces (Colour)	1¼

S-8	How To Bend Light (Colour)	1
S-2	How To Measure Time (Colour)	1
S-11	How To Produce Electric Current With Magnets (Colour)	1
S-9	Light and Colour (Colour)	1¼
S-12	Magnetic, Electric and Gravitational Fields (Colour)	1
S-7	Vibrations (Colour)	1¼
S-6	Waves and Energy (Colour)	1
S-10	What Is Electric Current (Colour)	1¼
S-1	What Is Space (Colour)	1
S-4	What Is Uniform Motion (Colour)	1¼

SOCIAL STUDIES

Call No.	Film Title	Producer	No. of Reels	Curr. Division
AFRICA				
SS-550	Life in an Oasis (colour)	Coronet	1	Jr. Int.
SS-551	Life in Ancient Egypt (Colour)	C.F.I.	3	Int.
ASIA				
SS-574	Thailand, Land of Rice (colour)	E.B.	1¼	Int.
SS-575	Turkey: A Middle East Bridge-land (colour)	U.W.	1½	Int.
EUROPE				
SS-542	France and Its People (colour)	E.B.	1¼	Int.
SS-557	Mediterranean World, The (colour)	E.B.	2½	Int.
SS-570	Spain in the New World (colour)	E.B.	1½	Int. Sr.
GREAT BRITAIN AND IRELAND				
SS-572	State Opening of Parliament (colour)	U.K.I.S.	2	Int.
CANADA				
SS-537	City of Gold	N.F.B.	2	Int.
SS-541	Face of the High Arctic (colour)	N.F.B.	1½	Int. Sr.
SS-544	George P. Vanier	N.F.B.	3	Int. Sr.
SS-561	People of the Rock (colour)	N.F.B.	1¼	Int.
SS-568	Roughnecks (Oil drillers)	N.F.B.	2	Int.
SS-538	Climates of North America (Colour)	N.F.B.	2	Int.

Call No.	Film Title	Producer	No. of Reels	Curr. Division
WESTERN PROVINCES				
SS-566	Rocky Mountains: A Geographic Region (colour)	Coronet	1	Int.
SS-571	Stampede Stopover (colour)	Imp. Oil	2	Int.
ONTARIO				
SS-530	Abitibi (colour)	Abitibi	3	Int. Sr.
SS-582	History of Mail Delivery in Upper Canada (colour)	Pioneer	1	Jr. Int.
SS-563	Pioneer Village (colour)	Metro. Con.	3	Int. Sr.
SS-580	Village in the Dust (colour)	Imp. Oil	2	Int. Sr.
ATLANTIC REGIONS				
SS-559	My Island Home (colour)	N.F.B.	1½	Int. Sr.
SS-573	Stowaway, The (colour)	N.F.B.	1½	Int.
UNITED STATES AND POSSESSIONS				
SS-543	Frontier Boy of the Early Midwest (colour)	E.B.	1½	Jr. Int.
SS-558	Mississippi River, The (colour)	Coronet	1¼	Int.
SS-564	Plymouth Colony, The First Year (colour)	Coronet	1½	Int.
SOUTH AND CENTRAL AMERICAS				
SS-534	Brazil, Geography of South America (colour)	Coronet	1½	Int. Sr.
SS-536	Chile (colour)	McG.-H.	1½	Jr. Int.
SS-539	Countries of the Andes (colour)	Coronet	1	Jr. Int.
SS-545	Guatemala (colour)	E.B.	1½	Int.
SS-548	Incas, The (colour)	Coronet	1	Int.
SS-552	Life in Grasslands: Argentine Pampas (colour)	Coronet	1	Int.
SS-553	Life in High Andes (colour)	Coronet	1	Jr. Int.
SS-562	Peru (colour)	McG.-H.	2	Jr. Int.
SS-569	South America: Geography of the Continent (colour)	Coronet	2	Int.
COMMUNITY SERVICES				
SS-581	Wires to our House (colour)	I.F.B.	1½	Jr.

Call No.	Film Title	Producer	No. of Reels	Curr. Division
HISTORY				
SS-532	Baldwin, R — Matter of Principle	N.F.B.	2½	Int.
SS-533	Bolivar: South American Liberator (colour)	Coronet	1	Int. Sr.
SS-540	English and Dutch Colonization in the New World (colour)	Coronet	1	Int. Sr.
SS-546	Holy Roman Empire (colour)	Coronet	1¼	Int. Sr.
SS-547	Howe, J. — Tribune of Nova Scotia	N.F.B.	2½	Int.
SS-554	Lord Elgin — Voice of the People	N.F.B.	2½	Int.
SS-555	Lord Durham	N.F.B.	2½	Int.
SS-556	W. L. Mackenzie — Friend to His Country	N.F.B.	2½	Int.
SS-560	Papineau — The Demi-God	N.F.B.	2½	Int.
SS-565	Prehistoric Man in Northern Europe	E.B.	1¼	Sr.
SS-567	Room of Destiny	N.F.B.	1½	Int.
SS-576	United Empire Loyalists (colour)	Pioneer	1½	Int.
SS-577	United Nations: The Charter	N.F.B.	1½	Int. Sr.
SS-578	United Nations: General Assembly	N.F.B.	1½	Int. Sr.
SS-579	United Nations: Trusteeship Council and System	N.F.B.	1½	Int. Sr.
TRANSPORTATION AND COMMUNICATION				
SS-531	Airport in the Jet Age (colour)	C.W.	1	Jr.
SOCIAL STUDIES: PRIMARY				
SS-535	Children in Autumn (colour)	E.B.	1	Pr.
SS-549	Let's Build a House (colour)	C.W.	1	Pr.
TEACHER TRAINING				
T-69	Hickory Stick	M.H.F.B.	2¼	
T-70	Mathematics At Your Fingertips (colour)	N.F.B.	3	
T-71	Teaching Machines and Programme Learning	U.S.O.E.	3	
T-72	Vital Decision, A (colour)	Scarboro	2	

Art

A-84 ART AND YOU (Colour) 11 MINS.

Introduces the student to the world of art, its nature, styles and modes of expression. For elementary through high school art appreciation and creative art classes.

A-85 CARAVAGGIO AND BAROQUE (Colour) 14 MINS.

As innovator and non-conformist, Caravaggio stands out against the background of the Baroque and man's fascination with space. He added to the social ferment of Reformation by bringing about a rebellion in the arts against the mannered idealism of the past. This study of his works shows that nature alone — the direct experience of the senses — was dramatization directly to nobleman and peasant alike, and had a vast effect on the development of artistic express.

A-86 COLLAGE — EXPLORING TEXTURE (Colour) 13 MINS.

The making of collages — pictures made by applying materials to a flat surface — by children five to eight is depicted. A class is shown at work, guided by a skilled teacher. The children's selection of materials, interest in textures, and imaginative arrangements are shown; and means of motivating creative activity are indicated. The film is intended for primary and middle grades, for teachers and for teacher training.

A-87 DESIGN INTO SPACE (Colour) 11 MINS.

An unusual and exciting approach to three-dimensional design is introduced in "Design Into Space". Many sequences show clearly the materials and techniques which may be used to create types of space sculpture. Examples of the work of Gabo and Richard Lippold are included.

A-88 DESIGN WITH PAPER (Colour) 11 MINS.

Planned for use with Intermediate and Senior grades, this film explores the many structural and design possibilities in the use of paper. The last part of the film illustrates numerous practical applications of paper design.

A-89 DISCOVERING COLOUR (Colour) 15 MINS.

An exciting film for art classes. The art of mixing colour is shown in a beautiful visual presentation that is at once stimulating and educational. For elementary art classes.

A-90 DISCOVERING PERSPECTIVE (Colour) 14 MINS.

We live in a world of depth, of distance. Some things are close to us, some far away. We can create the appearance of distance on a flat surface by using perspective. Overlapping, vertical position, graying colours, varying detail, varying size, and converging lines are techniques used to create perspective. Any one or more of these methods helps to create the appearance of depth, or distance, on a flat surface.

A-91 DISCOVERING TEXTURE (Colour) 17 MINS.

All through life, we learn about textures by touching and looking. Some textures are man-made; some are natural. Discovering textures can be a daily adventure. Our world is full of many textures for us to enjoy . . . some we feel, some we see, and some we create.

A-92 LINE AND ART (Colour) 11 MINS.

Concepts of line as visual images are developed, beginning with the phenomenon of line in nature and man-made forms. Through excellent selections ranging from the primitive and the "old masters" to the contemporary, the film emphasizes the artist's response to various media, indicates how form and volume can be evolved from line, and illustrates illusions of space and tension, as well as the infinitive possibilities for innovation and interpretation through line.

A-93 WHAT SHALL WE PAINT (Colour) 11 MINS.

Ideas to paint are everywhere, as the children in this film discover. An excellent film to stimulate your classes to creative activity in the arts.

English

E-90 HAMLET: THE AGE OF ELIZABETH (Colour) 30 MINS.

The background of Elizabethan England as well as a comparison of the Globe Theatre and the modern theatre.

E-91 HAMLET: WHAT HAPPENS IN HAMLET (Colour) 30 MINS.

The major characters, the major movements and their relationship with one another are discussed.

E-92 HAMLET: THE POISONED KINGDOM (Colour) 30 MINS.

Poison plays an important part in the play "Hamlet" and in this film we are given a clear insight into just how important poison can be in any relationship.

E-93 HAMLET: THE READINESS IS ALL (Colour) 30 MINS.

The character of Hamlet is analyzed.

E-94 MORNING ON THE LIÉVRE (Colour) 14 MINS.

The scenic Liévre River, as it flows through the Laurentian hills in Northern Quebec, provides the inspiration for Archibald Lampman's poem. Two canoemen are seen travelling along the river through mist, sun and shadow to the accompaniment of the poem being read by poet George Whalley.

E-95 THE NOVEL: WHAT IT IS (Colour) 34 MINS.

Mr. Clifton Fadiman discusses the basic elements common to all novels: plot, character, setting, style, and form. Dramatic excerpts from many novels are presented by Mr. Fadiman to illustrate important concepts. Selections from "Moby Dick" and from the works of Charles Dickens are used to illustrate some of the special qualities which set good novels apart from those that are simply entertaining. Special emphasis is placed on the author's ability to create a world that is unique and complete, peopled with believable, living characters.

E-96 THE NOVEL: EARLY VICTORIAN ENGLAND AND CHARLES DICKENS (Colour) 34 MINS.

Mr. Fadiman examines in this film the civilization which Dickens reflected, attacked, and transcended — that of Victorian England. Numerous excerpts from Dickens' novels show, as only Dickens could, the startling contrasts of his age — its morality and hypocrisy, its respectability and criminality, its splendor and its squalor.

E-97 THE NOVEL: GREAT EXPECTATIONS — PART I (Colour) 34 MINS.

Carefully selected dramatic scenes used in this film establish the setting, characters, and shape of the novel and introduce some of the major themes which make up the novel's deeper content.

Mr. Fadiman traces the main narrative threads which make up Dickens' masterpiece: the young Pip's introduction to Miss Havisham and Estella, his later introduction to the great life of London, and the promise of his great expectations.

E-98 THE NOVEL: GREAT EXPECTATIONS — PART II (Colour) 34 MINS.

In this film Mr. Fadiman probes more deeply into the meanings lying behind the story. He explains the development of parallel relationships between the major characters, Magwitch and Pip, Miss Havisham and Estella. He also interprets the dominant themes which are inter-related with character development. The main thread of the narrative is traced through several dramatic scenes. It becomes clear that in Pip's stumbling

progress to self-understanding are mirrored much of the stupidity, hypocrisy, and also the virtues of the Victorian age itself.

E-99 PARTS OF SPEECH 13½ MINS.

A fun-filled afternoon at the beach with Sue, Fred, and their friends provides an opportunity to use the parts of speech in building the pictures we see. The film introduces the eight parts of speech and explains that they may name things, modify other words, connect words, or tell about actions.

E-100 STORY OF A BOOK (Colour) 10 MINS.

This film follows a real life author, H. C. Holling, through the exciting and satisfying process of creating Pagoo, the story of a hermit crab. Highly visual sequences show the steps of this process: getting the idea, doing the research both in the library and by observation, writing and rewriting, illustrating, planning the dummy, and printing.

E-101 THUMBELINA 11 MINS.

Delightful graphics present the fairy tale in a very pleasing manner. A tiny girl called "Thumbelina" was born from a beautiful flower. A large wet toad wanted to marry her to his son; rich old Mr. Mole also proposed. Thumbelina is eventually saved by a swallow and taken to Greece where she finds happiness.

E-102 WOODY WOODCHUCK'S ADVENTURE (Colour) 11 MINS.

The film begins in late winter as Father Woodchuck comes out of his burrow to survey the weather. Father Woodchuck makes sure there are no enemies about before bringing his family from the den. Soon the hungry woodchucks are feasting on tender grass, leaves, and roots. Woody, one of the little chucks, wanders away and is captured by a boy named Michael and his dog, Blackie. Michael wants to keep the little chuck for a pet, but Woody escapes and returns to his forest home. In early fall Woody digs the burrow that will be his winter home.

Guidance

G-101 YOU CAN GO A LONG WAY! 21 MINS.

This film explores the advantages of finishing high school and getting as much additional training and education as possible before looking for a job. It points out the increased competition for jobs, changes in methods, and technological advances which demand higher educational standards and shows how an extra year or two in school may mean a lifetime of better living and better security.

Health and Safety

H-105 IT'S BEST TO KNOW 8 MINS.

Produced by the Alcoholism and Drug Addiction Research Foundation of Ontario. Suitable for use in Grades 11, 12 and 13. In requesting this film, the principal must be assured that its use in the school will be entrusted to teachers of experience and judgment who will promote without embarrassment in the classroom a sincere discussion of the problems involved in consumption of alcoholic beverages. It is essential that the film be studied before presentation to a class and that a suitable introduction and typical questions as an aid in class evaluation of it be used, such as those provided with the film.

H-106 MUSCLES AND BONES OF THE BODY (Colour) 11 MINS.

This film emphasizes the importance of the muscles and bones to the internal and external functioning of the human body, showing how tendons, joints, muscles, and the bones of the skeleton work smoothly together as one unit. We learn the difference between voluntary and involuntary muscles and the importance of proper exercise and diet to a healthy body.

S-107 RESCUE BREATHING 18 MINS.

A clear dramatic presentation of the techniques used in applying mouth-to-mouth artificial respiration. Its application in various types of emergency situations is demonstrated.

Home Economics

HE-26 FLAXEN HERITAGE (Colour) 14 MINS.

The story of Irish linen is depicted, from the planting of the flax seed to the processing of the finished fabric. The major operations — retting, scutching, combing, spinning, bleaching and weaving — have been transformed from age old methods through the use of modern machinery and technology. Many uses of linen are shown as they contribute to everyday living.

HE-27 TIPS FOR TABLES (Colour) 13 MINS.

Table setting can be an art. By offering a variety of unique, imaginative, yet practical, table-settings and centrepieces for simple luncheons and formal dinners, this film stimulates the creative ability of the hostess. Suggestions for simple-to-make place mats and napkins are included, as well as original ideas for centrepieces.

Industrial Arts

IA-11 OFFICE COURTESY (Colour) 12 MINS.

Dramatizes techniques for office workers in meeting and working with persons outside the company, face to face and over the telephone. Emphasizes the importance of courtesy and thoughtfulness and reveals how the employee's attitude may, without his realizing it, have considerable effect on his company's success.

IA-12 OFFICE ETIQUETTE 14 MINS.

Shows how courtesy can be applied to typical situations such as applying for a job, reporting for work the first day, and performing routine secretarial duties. Emphasizes consideration for fellow workers and employer, telephone courtesy, promptness, and desirability of a friendly but businesslike attitude while on the job.

IA-13 OFFICE TEAMWORK (Colour) 12 MINS.

Illustrates the importance of co-operation among the members of a business organization. Dramatizes representative office situations in which teamwork is extremely important, and reveals the effects of various employee attitudes on company morale and business.

Language

L-8 THE TAN-GAU METHOD (Colour) 29 MINS.

This film, which was produced in 1962 for the Canadian Conference on Education, illustrates in two 14-minute lessons the Tan-Gau approach for teaching oral French.

Physical Education

PE-76 LAWN TENNIS—INSTRUCTION AT WIMBLEDON—PART 1. 20 MINS.

A film in two parts which demonstrates the strategy and strokes of tennis. Dan Maskell, training manager of the British Lawn Tennis Association, gives tennis instruction to junior players. His comments on correct methods of play are illustrated by shots at Wimbledon where such players as Angela Mortimer, Althea Gibson, Lew Hoad and Ashley Cooper, show these same principles applied in champion tennis.

PE-77 LAWN TENNIS—INSTRUCTION AT WIMBLEDON—PART II 20 MINS.

Advanced techniques, as in Part I.

PE-78 BEGINNING TENNIS 15 MINS.

Fundamental techniques of tennis are demonstrated by Carmack Berryman with emphasis on the drive, serve, volley and smash. This film should prove useful for beginners at the game.

TRACK AND FIELD SERIES

These films were made at Yale University, under the direction of Dr. Frank Ryan, Field Events Coach. Excellent for use of Coaches, especially in competitive sport at the senior high school and college level. They deal with those fundamentals that have been found of great importance in the last few years, as well as good training methods and auxiliary conditioning. Emphasis is on coaching rather than on instruction.

PE-79 TRACK AND FIELD: BROAD JUMP (Colour) 14 MINS.
PE-80 TRACK AND FIELD: DISCUS (Colour) 14 MINS.
PE-81 TRACK AND FIELD: HIGH JUMP (Colour) 14 MINS.
PE-82 TRACK AND FIELD: HURDLES (Colour) 14 MINS.
PE-83 TRACK AND FIELD: POLE VAULT (Colour) 14 MINS.
PE-84 TRACK AND FIELD: SHOT PUT (Colour) 14 MINS.

Science—Biology

SB-38 ARTHROPODS: INSECTS AND THEIR RELATIVES (Colour) 11 MINS.

Through magnified close-ups, and detailed anatomical drawings, the camera reveals the major physical characteristics which identify the arthropods, the largest animal grouping. Examples from each of the four main classifications — myriapods, insects, arachnids, and crustaceans — are compared and studied with reference to their common characteristics, their natural environment, and the ways in which they are helpful and harmful to man.

SB-39 AROUND A BIG LAKE (Colour) 17 MINS.

The film traces the effects of weather through the seasons on the environmental conditions in and around a typical large lake. Particular attention is focused on adaptations important for survival in the various habitats.

SB-40 BIOLOGY IN TODAY'S WORLD (Colour) 11 MINS.

This film stresses the growing importance of biological science, and introduces the many kinds of work done by professional biologists in such fields as bacteriology, horticulture, animal husbandry, entomology, and immunology. In the basic areas of food production, food processing and preservation, and in the maintenance of health, the film clearly demonstrates man's dependence on biology.

SB-41 HIBERNATION AND OTHER FORMS OF DORMANCY (Colour) 11 MINS.

This film provides a remarkable camera study of various animals adjusting to the hardships of their environment during the winter months. As food becomes scarce and temperatures change, some animals, such as the ground squirrel, go into hibernation. Some, like the spadefoot toad, go into a deep sleep called estivation; others, such as the bear and raccoon, merely sleep for long periods of time.

SB-42 LIFE IN THE DESERT (Colour) 11 MINS.

Seemingly desolate, the hot dry lands of the West support a variety of plants and animals. There is enough food, water, and safety for living things that are adapted to desert conditions, but the community's survival depends on the balance of nature.

Biology Series

B-15 ADAPTIVE RADIATION — THE MOLLUSKS (Colour) 20 MINS.

Illustrates the principle of adaptive radiation and shows how the typical molluscan characteristics are modified in each of the six classes. Live photography of many species of mollusks, such as chitons, snails, clams and oysters, tooth shells, and the squid, is used to show the ways in which mollusks are adapted to specialized and different ways of life.

B-13 ANGIOSPERMS — THE FLOWERING PLANTS (Colour) 18 MINS.

Describes the structural and reproductive characteristics which distinguish angiosperms from other plants. Animation and time-lapse photography are used to trace the processes of pollination, formation of seeds and fruit, seed dispersal, and plant growth in angiosperms. Illustrates a wide variety of angiosperms, and explains their importance to man.

B-28 THE BLOOD (Colour) 18 MINS.

Describes the circulation of the blood, its composition, and its functions in supporting cell processes. Photomicrography, animation, and demonstrations are used to show blood cell structure and locomotion, the formation of new blood cells, blood circulation and capillary structure and function. The film also explains blood typing and the test for the RH factor.

B-2 THE CAVE COMMUNITY (Colour) 13 MINS.

Illustrates how the study of plant and animal life in the unusual and relatively unchanging environment of the cave community provides biologists with important data for understanding some of the mechanisms of adaptation and evolution of species. Shows the evolutionary and adaptive modifications of cave-dwelling bats, fish, salamanders, and insects.

B-16 THE CHICK EMBRYO: FROM PRIMITIVE STREAK TO HATCHING (Colour) 15 MINS.

Demonstrates the development of a chick embryo during incubation and its emergence from the shell. Time-lapse photography and photomicrography are used to show the chief processes in the development of the chick embryo from primitive streak to hatching.

B-3 THE COMMUNITY (Colour) 11 MINS.

Introduces the concept of the ecological community. Shows the complex network of interrelationships among a group of plants and animals adapted to the same general physical conditions, and demonstrates that each organism in a community plays a particular role. Food chains and food webs of typical biotic communities are illustrated.

B-4 THE DESERT (Colour) 22 MINS.

Illustrates the interrelationships between plant and animal life and the physical environment of the desert. The geographical locations of desert areas, their ecological conditions, the causes of their formation, and their aridity are shown. Describes the adaptive mechanisms of a wide diversity of plant and animal life to the hot, arid desert environment.

B-29 DNA: MOLECULE OF HEREDITY (Colour) 16 MINS.

Dr. George W. Beadle, discoverer of DNA and Nobel prize winner, explains why DNA (deoxyribonucleic acid), a giant molecule of the cell's chromosomes, is the basis of growth and reproduction and the mechanism for transporting hereditary "specifications" from one generation to the next. Illustrated with photomicrography, animation and models.

B-17 ECHINODERMS — SEA STARS AND THEIR RELATIVES (Colour) 17 MINS.

Describes the characteristics of the echinoderm body plan and shows how it is adapted for locomotion, respiration, digestion, and reproduction. Examples of the five classes of echinoderms are shown, and the various stages of reproduction and development are illustrated with live photography and photomicrography.

B-18 THE FIRST MANY-CELLED ANIMALS — THE SPONGES (Colour) 17 MINS.

Demonstrates that the sponge represents one development of multi-cellularity in animals, and shows some of the adaptations of the body plan of this primitive animal. Live photography, animation, photomicrography and laboratory experimentation are used to show life processes and adaptation of sponges to their environment.

B-27 FUNDAMENTALS OF THE NERVOUS SYSTEM (Colour) 17 MINS.

Illustrates the two major divisions of the nervous system and explains their functions. With live photography, photomicrography, animated drawings and demonstrations, the film shows how the nervous system conveys external information from the sense organs to the brain, coordinates the information with present and past experience, and directs muscles and other organs to adaptive behavior.

B-10 FUNGI (Colour) 17 MINS.

Demonstrates that fungi are simple plants which are dependent upon other organisms for food. Illustrates how fungi grow and how they get their food. Explains the importance of fungi as a source of food, as agents in food processing, and as a cause of disease in plants and animals.

B-5 THE GRASSLANDS (Colour) 17 MINS.

This film illustrates the ecological interrelationships of the grasslands biome. Shows the locations of the world's grasslands, explains how they may have originated, and describes their importance as food-producing areas. Demonstrates the dependence of animal life on the dominant plants, the perennial grasses, and gives examples of typical food chains.

B-12 GYMNOSPERMS (Colour) 17 MINS.

Demonstrates that gymnosperms are seed plants which bear their seeds on cones. Animation and time-lapse sequences trace the life cycle of the pine through the growth of the pollen and

seed cones, pollination, fertilization and germination of seeds. Examples of lesser-known gymnosperms are shown and the importance of conifers is illustrated.

B-6 THE HIGH ARCTIC BIOME (Colour) 22 MINS.

Describes the constant struggle of plants and animals for survival in the harsh environment of the high arctic biome. Shows that few species are adapted to live in a region of long, cold and dark winters and short, cool summers. Photographed on the arctic coastal lands of Canada.

B-21 THE JOINTED-LEGGED ANIMALS—ARTHROPODS (Colour) 17 MINS.

Illustrates the structural and functional characteristics of animals in the phylum Arthopoda, provides examples from each of the five classes, and describes their evolutionary development. The processes of metamorphasis and moulting are illustrated using photmicrography and time-lapse photography. The economic importance of arthropods to man is discussed.

B-30 MITOSIS (Colour) 24 MINS.

This film illustrates the fundamental process of cell division in plant and animal life, and discusses the importance of the mitotic process to the growth and maintenance of an organism. Photomicrography shows the process of cell division actually taking place in a living cell. The effects of chemicals and radiation on dividing cells are demonstrated.

B-11 SEED GERMINATION (Colour) 15 MINS.

Explains how seeds serve plants in reproduction, distribution, and as a device to survive unfavorable climatic periods. Shows how seed germination studies aid biologists in understanding growth, development and metabolism. Illustrates the importance of seeds as a source of food for man. Demonstrations with germinating seeds are shown using time-lapse photography.

B-23 SEGMENTATION — THE ANNELID WORMS (Colour) 16 MINS.

Describes the structure and functions of the segmented worm body systems, and shows that the segmented annelid worm body plan represents an important evolutionary development. The major classes of the phylum Annelida are illustrated. Animated drawings show the structure and functions of the nervous digestive and reproductive systems of the earthworm.

B-14 SIMPLE PLANTS — THE ALGAE (Colour) 18 MINS.

This film illustrates typical forms of algae, explains their structure, describes their evolutionary development, and shows how algae have adapted to all types of moist environments. The reproductive processes of algae are shown with photomicrography. The importance of algae to aquatic animals and man is explained.

B-19 THE SINGLE CELLED ANIMALS — PROTOZOA (Colour) 17 MINS.

Illustrates the characteristics and behavior of representatives of each class of protozoans, demonstrates the processes of digestion and reproduction in representative protozoans, and discusses theories of protozoan evolution from ancient single-celled plants. Shows the structures which various classes of protozoans use for movement and food-gathering.

B-22 SOCIAL INSECTS: THE HONEYBEE (Colour) 24 MINS.

Shows that social insects, such as the honeybee, live in colonies and are divided into castes, each of which contributes to the life of the colony. Illustrates the particular adaptation of various castes to reproduction, population control, and food gathering, and shows the metamorphosis of a honeybee from egg to adult. How bees communicate is shown and explained.

B-20 STINGING-CELLED ANIMALS — COELENTERATES (Colour) 17 MINS.

Describes the characteristics of the phylum Coelenterata, describes the typical coelenterate body plan, and provides examples of the three classes of coelenterates. Shows how coelenterates obtain and digest their food, how they reproduce by sexual and asexual processes, and how they move.

B-7 SUCCESSION — FROM SAND DUNE TO FOREST (Colour) 16 MINS.

Illustrates the process and general principles of ecological succession by which an area slowly and continuously changes until it becomes a stable natural community. This film, photographed in the dunes at the southern end of lake Michigan, shows one of the earliest and most thoroughly studied examples of this process.

B-8 THE TEMPERATE DECIDUOUS FOREST (Colour) 16 MINS.

Illustrates the complex network of plant and animal relationships that make up the temperate deciduous forest community. Shows typical deciduous forest plants and animals and their adaptations to seasonal change. The full yearly cycle of spring,

summer, autumn and winter is shown through the use of time-lapse, photomicrography and live photography.

B-9 THE TROPICAL RAIN FOREST (Colour) 16 MINS.

This film illustrates the interrelationships between the rich variety of plant and animal life and the warm, humid environment of the tropical rain forest. Shows the layered structure of tropical rain forest vegetation, describes conditions of temperature and rainfall, and provides examples of both typical and rare species of tropical rain forest animal and plant life.

B-24 WHAT IS AN AMPHIBIAN? (Colour) 11 MINS.

Illustrates the body structure and life process of amphibians and shows how they are adapted to live in water and on land. Presents the development of an amphibian from egg to maturity and traces the origin and evolution of the amphibian. Discusses the ways in which the study of amphibians has contributed to man's knowledge of embryology and development.

B-25 WHAT IS A BIRD? (Colour) 17 MINS.

Describes the ways in which the body structures of birds are adapted for flight, and shows how birds are able to live in a wide variety of environments because of their structural characteristics and behavior. Illustrates behavioral patterns such as nesting, care of the young and migration. Describes the evolutionary relationships between birds and reptiles.

B-26 WHAT IS A REPTILE? (Colour) 18 MINS.

This film illustrates representative kinds of the four orders of reptiles and describes their physical characteristics, reproductive processes, and evolutionary development. Discusses reasons for the reptiles' successful evolution and survival — the evolution of the land egg, the waterproof skin, and the improved limbs. Describes the characteristics and behavior of a wide variety of reptiles.

B-1 WHAT IS ECOLOGY? (Colour) 11 MINS.

Introduces the study of ecology by illustrating the wide variety of interrelationships between plants, animals, and their environment. Shows how biologists study these interrelationships and explains the importance of such studies to mankind. The major biomes of the world are introduced.

Science — Chemistry

SC-20 CHEMICAL CHANGES (Colour) 12 MINS.

In understandable terms and simple experiments, the film explains some of the chemical changes that are taking place all around us, illustrates the difference between physical and chemical change and demonstrates some of the tests used by chemists in which chemical changes play a part.

SC-21 NITROGEN AND LIVING THINGS (Colour) 13½ MINS.

Nitrogen is one of the elements essential for plant growth, although most plants cannot take nitrogen from the air; their supply must come from nitrogen compounds in the soil. The various processes in nature of the formation of these nitrogen compounds is demonstrated. Man and animals must depend on plant life for their supply of essential nitrogen.

SC-22 STORY OF HEAT (Colour) 15 MINS.

A camping trip serves to introduce a study of the basic sources and properties of heat, and the harnessing of heat energy to serve man. Vivid, live, dramatic and animated sequences illustrate such terms as friction, kindling point, motion of molecules, radiation, conduction, and convexion. Latest application of the basic scientific principles of heat energy in an atomic power plant and nuclear submarine are also shown.

Chemistry

C-1 INTRODUCTION (Colour)

All the things one sees around him are chemicals and most of the changes in them involve chemical reactions. Some familiar reactions are shown in the film as examples.

C-2 CLASSIFYING MATTER — THE NEED (Colour)

The film shows the mixed-up character of natural materials and the spontaneous tendency of things to get mixed. The film shows various ways of classifying a list of things or a group of objects and it shows that no way is perfect.

C-3 THE PHYSICAL STATES OF MATTER (Colour)

One way to classify substances is as solid, liquid, or gas. Ice is used to illustrate the solid phase, water, the liquid phase, and steam (without any fog) the gas phase. The centigrade and Fahrenheit temperature scales are illustrated.

C-4 CLASSIFYING MATTER — A METHOD (Colour)

The substances in nature are usually heterogeneous. Heterogeneous systems can often be separated into homogeneous parts by simple means, such as, sorting, dissolving and filtering, and distilling. The film depicts these and other ways of classifying matter.

C-5 ATOMS AND MOLECULES (Colour)

Ways of distinguishing experimentally between heterogeneous systems and homogeneous systems, and between solutions and pure substances (compounds or elements), are reviewed. The idea of the element is introduced. The idea of the molecule is introduced.

C-6 A CHEMICAL REACTION AND ITS EQUATION (Colour)

The experimental basis for the chemist's system of classification of substances is reviewed and interpreted in terms of the kinds of molecules and atoms present and their distribution in the substances. The distinction between a symbol and a formula is emphasized. The Law of Conservation of Mass is tested.

C-7 COMBUSTION — MOLECULES IN ACTION (Colour)

The writing of chemical equations is reviewed. Chemical equations are developed for several reactions. The reactions include the burning of butane, paper, carbon, kerosene, and alcohol. Animated drawings are used to show molecular motion.

C-8 ATOMS AND THEIR WEIGHTS (Colour)

Atoms are too small to weigh individually on chemical balances but their individual masses can be measured in a mass spectograph. Those atoms deflected least are the heaviest. The kinds of weight units commonly used are reviewed.

C-9 OXYGEN: THE EARTH'S MOST ABUNDANT ELEMENT (Colour)

Our most familiar element, oxygen, is discussed. Some oxygen is prepared from potassium chlorate and the effect of manganese dioxide as a catalyst is shown. Some reactions of the oxygen are also shown.

C-10 MOLECULES AND THEIR WEIGHTS (Colour)

Formula weights, (whenever formulas represent molecules), can be calculated simply by adding the symbol weights. Calculations are illustrated for oxygen gas, ozone, water, methane, et. al. The percentage composition is calculated for methane, for nitrous oxide, and for ethyl alcohol.

C-11 WEIGHING — THE ANALYTICAL BALANCE (Colour)

The various parts of the balance are shown and their functions are discussed. A method for weighing accurately is shown. A method of recording the exact weight of the object is shown.

C-12 THE MOLE CONCEPT (Colour)

The concept of mole is introduced. As applied to atoms the mole represents a very large number of atoms, 6.023×10^{23} atoms. This number of atoms is used to define a mole because a sample of oxygen, which contains this many atoms, weighs 16 grams.

C-13 USING THE MOLE CONCEPT (Colour)

The concept of the mole is enlarged to include particles other than the atom. The equation for the reaction between hydrogen and oxygen to form water is discussed. Illustrations are given for calculating the numbers of grams of reacting substances from the numbers of moles of reacting substances.

C-14 THE EMPIRICAL FORMULA OF A COMPOUND: AN EXPERIMENTAL DETERMINATION (Colour)

A weighed piece of silver is placed in a weighed crucible, covered with sulfur, and heated. The sulfur melts and reacts with the silver. More sulfur is added, and the procedure is repeated until a constant is reached. The formula derived is called the empirical formula of the compound.

C-15 BRIEF REVIEW, LESSONS 1-14 AND A FIRST LOOK AT HYDROGEN (Colour)

The results from Lesson 14 are reviewed. The formula obtained for silver sulfide is an empirical formula, not a molecular formula. Ideas and concepts from previous lessons are reviewed. Hydrogen, the lightest element, is then considered.

C-16 MOLE AND WEIGHT RELATIONSHIPS IN CHEMICAL REACTIONS (Colour)

The combustions of ethyl alcohol and ethane are considered. Three-dimensional models of the alcohol are used to show how the atoms are arranged in the alcohol molecule. The structure of alcohol is related to that of water.

C-17 LAWS OF STOICHIOMETRY AND THE ATOMIC THEORY (Colour)

The Laws of Conservation of Mass, of Definite Proportions, of Combining (Reciprocal) Proportions, and of Multiple Proportions are discussed.

C-18 INTRODUCTION TO GAS BEHAVIOR (Colour)

The assumptions of the kinetic-molecular theory result in a picture of gases which enables us to explain the experimental behavior of gases.

C-19 GAS PRESSURE: ORIGIN AND MEASUREMENT (Colour)

The variables used for gases are reviewed, but in this lesson pressure and its relation to the number of moles (volume and temperature being kept constant) will be studied particularly. A mercury barometer is shown. A manometer is shown and compared with the barometer.

C-20 PARTIAL PRESSURES; BOYLE'S LAW (Colour)

The students are given a problem in partial pressures to solve. The pressure unit, the atmosphere, is defined. The variation of pressure with volume (at constant temperature and number of moles) is discussed. Some data are obtained experimentally.

C-21 THE "GAS" TEMPERATURE SCALE: ABSOLUTE ZERO (Colour)

The pressure at 100° C is read for a constant number of moles of a gas at constant volume. The gas is then cooled to 27° C, and the pressure is read again. The gas is placed in an ice bath, and the pressure is read again. The best value from many accurate determinations is called absolute zero.

C-22 GAS LAW CALCULATIONS — HOW ERRORS ARISE IN EXPERIMENTS (Colour)

The experimental results of the previous two lessons are reviewed. The relations between pressure and the variables — volume, temperature, and number of moles — are reviewed and new relations are discussed. These relations are applied to a general gas problem.

C-23 SPEEDS OF MOLECULES — GASEOUS DIFFUSION (Colour)

The gas problem considered in Lesson 22 is continued. The experimental effect of temperature on pressure is explained in terms of the movement of the molecules. The speeds of diffusion of hydrogen chloride and ammonia are measured in a tube. The times of escape of oxygen gas and hydrogen gas from a vessel through a small hole are measured.

C-24 STANDARD TEMPERATURE AND PRESSURE — GAS DENSITY AND MOLAR VOLUME (Colour)

The rounding off of numbers is applied to the problem given in Lesson 23. Other items reviewed are diffusion experiments,

temperature as a measure of kinetic energy, and the relation of the speeds of molecules at a given temperature to their masses. The common P, V, T, units for gases are reviewed.

C-25 DETERMINATION OF MOLECULAR WEIGHTS OF GASES (Colour)

An experiment is carried out in which the weight of an unknown gas in a flask is compared with the weight of the same flask filled with oxygen. From these weights the molecular weight of the unknown gas can be determined.

C-26 FORMULAS: EMPIRICAL AND MOLECULAR USING MOLAR VOLUMES (Colour)

The experiment in Lesson 25 and its calculations are reviewed. The distinctions made earlier between molecular formulas and empirical formulas are reviewed. Examples are given of different substances with the same empirical formula but different molecular formulas.

C-27 DETERMINATION OF MOLECULAR WEIGHTS OF LIQUIDS AND SOLIDS (Colour)

A known weight of a liquid is evaporated in such a way that the vapor formed displaces a corresponding volume of air. The volume of this air and its temperature and pressure, are measured: the volume of displaced air equals the volume of the weighed sample of the unknown as a gas at the same conditions.

C-28 NUMBER-WEIGHT-VOLUME RELATIONSHIPS — A REVIEW (Colour)

In this review lesson a number of important concepts are reviewed and correlated. Some calculations are made showing how information read from equations can be used to the best advantage.

C-29 A FIRST LOOK AT ATOMIC STRUCTURE (Colour)

The development of ideas about the structure of atoms in terms of the fundamental particles is traced. The results of Rutherford's experiments are reviewed.

C-30 THE NUCLEUS AND THE NEUTRAL ATOM (Colour)

A periodic chart of the elements is introduced. Isotopes are discussed. Ions are discussed in terms of gain of extra electrons or loss of electrons by an atom. A problem on structures of some atoms and ions is assigned to the students.

C-31 ELECTRONIC ARRANGEMENTS — THE INERT GASES (Colour)

The problem assigned in Lesson 30 is solved. The previous lessons on atomic structure are reviewed. The properties of the family of inert gases are correlated to the "magic numbers", $2n^2$, of electrons in each level. The inert gases have no chemical reactions.

C-32 THE FORMATION OF IONIC COMPOUNDS (Colour)

The electron structures of some elements with atomic numbers near those of the inert gases are reviewed. Formation of ionic compounds from atoms of lithium, beryllium oxygen, and hydrogen is illustrated. The students are assigned a problem to work out.

C-33 IONIC COMPOUNDS AND IONIC BINDING (Colour)

Answers are given for the problems assigned in Lesson 32. Differences in energies of reactants and products are found for all reactions. Covalent binding is introduced with the hydrogen-hydrogen bond as an example.

C-34 COVALENT BINDING (Colour)

Ionic binding is reviewed. Covalent binding is described. The dot structures are written for hydrogen, fluorine, hydrogen fluoride, water, and chlorine monofluoride in accordance with the Lewis method. "Dash" structures are also written. A problem is assigned to the students.

C-35 IONIC AND COVALENT BINDING CONTRASTED (Colour)

The problem assigned in Lesson 34 is solved. Covalent bonding in a triatomic molecule is illustrated further with hypochlorous acid as the example. The principles of bonding, both ionic and covalent, are applied to many examples. Two problems are assigned to the students.

C-36 WATER, ITS STRUCTURE. POLAR MOLECULES (Colour)

Some ionic compounds are reviewed, but the greatest emphasis is on compounds with covalent binding. The structure of water molecules is used as a basis for discussing polar molecules, electrical asymmetry in molecules, and dipoles.

C-37 WATER: SOME OF ITS PROPERTIES (Colour)

Some peculiar properties of water are related to its molecular structure. A vapor pressure of water and the surface tension of water are demonstrated. Water is used without success to put out a magnesium fire. Students are asked to explain.

C-38 WATER; ITS PECULIAR PROPERTIES — TABLE SALT; ITS STRUCTURE (Colour)

Certain facts are related to the organization of water molecules discussed in Lesson 37. The structure of sodium chloride, an ionic solid compound, is examined in some detail.

C-39 IONIC COMPOUNDS AND ELECTRICAL CONDUCTIVITY (Colour)

Conductivity measurements are made for several substances under different conditions. The electron structures of sulfate ion and hydroxide ion are discussed.

C-40 IONIC COMPOUNDS CONTINUED. PRECIPITATION (Colour)

Conductivities of more ionic compounds are tested. New ions included are barium ions, calcium ions, and nitrate ions. The reason is given for using parentheses in such formulas as $Ca(NO_3)2$ and $Ba(OH)_2$. Two student problems are assigned.

C-41 HOW SALTS DISSOLVE IN WATER (Colour)

The dissolving of salt in water at moderate temperatures is explained in terms of the interactions of the dipolar water molecules with the ions of the salt to form larger ions which are free to move about independently in the solution. Equilibrium is studied with a saturated solution of lead iodide.

C-42 HYDROGEN CHLORIDE. PREPARATION AND PROPERTIES (Colour)

Two methods for preparing gaseous hydrogen chloride are mentioned; one is used to prepare a water solution of hydrogen chloride.

C-43 ACIDS AND BASES. AN INTRODUCTION (Colour)

Seven solutions are tested with respect to taste, feel, and effect on grape juice, tea, litmus paper, "yellow" paper, and magnesium. From the evidence, three of the solutions may be classified as acids, three as bases, and one as neutral. The results are summarized in the form of a chart.

C-44 DEVELOPING AN ACID-BASE THEORY (Colour)

On the basis of the experimental observations made in the preceding lessons, some solutions were classified as acids and others as bases. The observed facts are used to show how a general acid-base theory can be developed.

C-45 A TYPICAL ACID-BASE REACTION-INDICATORS (Colour)

The Bronsted-Lewry theory is reviewed. New terms are introduced. Indicators are used to show how one can tell exactly

how much sodium hydroxide solution must be added to a hydrochloric acid solution to neutralize it or how much hydrochloric acid solution must be added to neutralize a sodium hydroxide solution.

C-46 RELATIVE STRENGTHS OF ACIDS AND BASES (Colour)

The problem, "what happens when a hydrochloric acid solution is treated with an excess of sodium hydroxide solution," is discussed. On the basis of experiments involving competition for protons, a table is developed in which acids are listed, ranging from stronger to weaker.

C-47 CONSTRUCTION OF AN ACID-BASE TABLE (Colour)

The behavior of an acetic acid solution is compared with that of a hydrochloric acid solution. A solution is prepared from an equal number of moles of acetic acid and sodium acetate. Tests are conducted.

C-48 USING AN ACID-BASE TABLE (Colour)

The acid-base tables are extended to include other strong acids with their conjugate bases and other weak acids with their conjugate bases.

C-49 MAKING SOLUTIONS OF KNOWN CONCENTRATION (Colour)

Two methods for expressing concentrations of solutions are discussed: per cent by weight, and molarity. Volumetric flasks of various sizes are shown. A method is shown for preparing more dilute solutions from concentrated ones. Some problems for students are given.

C-50 AN ACID-BASE TITRATION (Colour)

The problems assigned in Lesson 49 are solved. Burets and the techniques for filling and operating are shown. A titration is carried out.

C-51 TITRATION OF A WEAK ACID — CALCULATIONS (Colour)

Sodium hydroxide, standardized in Lesson 50, will be used to determine the concentration of acetic acid in commercial vinegar. In this titration phenolphthalein is used as the indicator. Three problems, based on titration, are solved in detail.

C-52 DYNAMIC EQUILIBRIUM (Colour)

Two examples of equilibrium discussed in earlier lessons are reviewed. Results show that iodine moves from water to a carbon tetrachloride layer and also moves in the reverse direction.

C-53 CHEMICAL EQUILIBRIUM — A TYPICAL WEAK ACID (Colour)

The iodine experiment of Lesson 52 is re-examined after a twenty-four hour period. The reaction between acetic acid and water is studied as a further example of equilibrium. A solution is prepared so that it is molar in hydrochloric acid and molar in sodium acetate. Again the same equilibrium state is achieved from two directions. A problem is given to the students.

C-54 A SUMMARY OF EQUILIBRIUM PRINCIPLES (Colour)

The various equilibria studied up to now are reviewed in some detail. The factors affecting equilibrium are also reviewed. The known factors are used to make quantitative statements which can be expressed in algebraic form to develop an "equilibrium constant".

C-55 THE LE CHATELIER PRINCIPLE (Colour)

The effects of change in concentration of acetic acid, hydronium ion and acetate ion on the equilibrium between acetic acid and water are shown. Le Chatelier's Principle is applied to the ethyl acetate equilibrium.

C-56 APPLICATIONS OF THE LE CHATELIER PRINCIPLE (Colour)

The principle of Le Chatelier is applied to a general chemical reaction. The importance of temperature in chemical reactions is emphasized.

C-57 THE pH SCALE (Colour)

The ion-product constant for water, Kw, has a value,
$(H_3O^+) \times (OH^-) = 1.0 \times 10^{-14}$ at 25°C.

In pure water
$(H_3O^+) = (OH^-) = 1.0 \times 10^{-7}$.

A solution with these concentrations is called neutral. Facts enable us to set up an acidity scale which is also a basicity scale. The scale, the pH scale, uses the exponents of the H_3O^+ concentration (without the minus sign). pH values are measured on a pH meter for a number of common solutions.

C-58 BUFFER SOLUTIONS REVIEW (Colour)

The pH scale of acidity is reviewed. Typical buffer reactions are shown. Thermo-chemistry is introduced. The calorie and kilocalorie are defined. A calorimeter is shown.

C-59 THERMOCHEMISTRY TEMPERATURE AND REACTION EXTENTS (Colour)

The principle of Le Chatelier is used to show that the heat of reactions enables us to predict how change in temperature produces changes in equilibrium concentrations. Heat effects are demonstrated for the equilibrium between nitrogen dioxide and dinitrogen tetroxide and for the solubility of lead iodide in water.

C-60 RATES OF CHEMICAL REACTIONS (Colour)

The effects of temperature and of particle size are demonstrated for the dissolving of potassium dichromate. The "iodine-clock" reaction is carried out at various temperatures and with various concentrations of reagents and the resulting reaction times are measured.

C-61 TEMPERATURE REACTION RATES AND REACTION EXTENTS (Colour)

The data from the iodine clock experiment are reviewed. A pressure cooker is used to show how higher temperatures, with accompanying higher pressures, can be obtained with boiling water to give faster cooking rates. A reflux condenser for maintaining steady temperatures is shown. A dust explosion demonstrates the effect of large surface on the rate of reaction.

C-62 LABORATORY TECHNIQUES AND APPARATUS — I (Colour)

Demonstrates Laboratory techniques — how to light and regulate burners; how to cut and bend glass tubing; how to handle reagent bottles; how to smell gases such as ammonia. Demonstrates that good techniques are more effective as well as safer than poor ones.

C-63 LABORATORY TECHNIQUES AND APPARATUS — II (Colour)

Shows effective and safe ways of using laboratory apparatus including heating of liquids in test tubes, beakers and flasks; methods of evaporation; separation of solids by decanting and filtering, and centrifuging; use of dropping bottles and stirring rods and use of separating funnels.

C-64 COVALENT BINDING — A REVIEW — ITS GEOMETRY (Colour)

The kinds of chemical bonding are reviewed and again related to the position of the bonded atoms in the periodic system.

Ionic binding is reviewed briefly but the major emphasis is on covalent binding. Dot structures, "dash" structures, and three-dimensional structures are shown.

C-65 CARBON (Colour)

The structure of the diamond crystal is related to the tetrahedral nature of the carbon atom.

C-66 MULTIPLICITY OF CARBON COMPOUNDS (Colour)

Carbon bonds not formed with other carbon atoms are used to hold other atoms, principally, oxygen, nitrogen, chlorine (and other members of its family) and sulfur.

C-67 GEOMETRY OF CARBON COMPOUNDS — ISOMERISM (Colour)

Two or more compounds may have the same numbers and kinds of atoms per molecule, that is, have the same molecular formula. Such different compounds are called isomers.

C-68 ALKANES — THE SATURATED HYDROCARBONS (Colour)

The series of saturated hydrocarbons, differing by CH_2 in the molecular formula, form a homologous series, the alkanes. The first eight are discussed.

C-69 PETROLEUM (Colour)

The history, uses, and distillation of petroleum are discussed. Fractional distillation is illustrated with the partial separation of an alcohol-water solution.

C-70 GASOLINE AND MOTOR FUELS (Colour)

A scale, called octane number, is used to rate the antiknock quality of gasolines. Normal heptane is given a rating of zero and iso-octane is given a rating of 100. Additives, such as tetraethyl lead, raise the octane rating of regular gasolines.

C-71 ALKENES AND ALKYNES — THE UNSATURATED HYDROCARBONS (Colour)

If a hydrogen atom is removed from an alkane the remainder (not a stable molecule) is called an alkyl group or radical. Examples are given. Bromine is used to show the existence of unsaturated compounds in gasoline.

C-72 ALCOHOLS (Colour)

The alcohols are related to the hydrocarbons in having a hydroxyl group in place of one of the hydrogen atoms and are related to water in having an alkyl group in place of one of the hydrogen atoms of water. Both are referred to as functional groups.

C-73 COMPOUNDS CONTAINING THE CARBONYL GROUP (Colour)

The types of compounds discussed are: aldehydes, functional group, -ChO; ketones, functional group, CO; carbozylic acids, functional group, -COOH; and esters.

C-74 ORGANIC COMPOUNDS CONTAINING NITROGEN (Colour)

The bonding behavior of nitrogen in organic compounds is intermediate between that of oxygen and that of carbon. Nitro groups are formed when toluene and phenol are treated with nitric acid to form trinitrotoluene (TNT) and trinitrophenol (picric acid).

C-75 DYES — SOME PRINCIPLES OF ORGANIC SYNTHESIS (Colour)

Structures of sulfanilimide and p-amino benzoic acid are shown. Some general methods are shown. Different products are obtained when ethyl alcohol is treated with sulfuric acid at different temperatures.

C-76 SYNTHETIC POLYMERS I (Colour)

Molecular weights ranging up to ten million atomic weight units have been determined for polymers. Examples of commercial polymers are discussed.

C-77 SYNTHETIC POLYMERS II (Colour)

When a diene is polymerized, the polymers may be more complex because the monomers can add in different ways. Synthetic rubbers are made from diene polymers or co-polymers. Nylon is an example of a copolymer made by condensation.

C-78 NATURAL POLYMERS — CARBOHYDRATES AND PROTEINS (Colour)

Cellulose and proteins are important natural polymers. Glucose is the monomer of cellulose and of starch. The cellulose polymer may be partially broken down by several methods, formed into various shapes, and then regenerated to produce such commercial polymers as rayon and cellophane.

C-79 BIOCHEMISTRY — A GENERAL VIEW (Colour)

Biochemistry is the chemistry of living things. Fifteen or more elements have been found to be essential in animals and in plants. Water is the most abundant substance, organic material is next, and inorganic material (mostly salts) is least abundant.

C-80 CARBOHYDRATES AND FATS (Colour)

Carbohydrates are classified in terms of complexity. The spinning of a cellulose acetate rayon is shown.

C-81 PROTEINS — ENZYMES (Colour)

Certain proteins have the ability to catalyze chemical reactions — they are called enzymes. The effect of catalase on hydrogen peroxide is demonstrated. Demonstrations of some enzyme reactions include: action of pepsin on egg, action of amylase and the action of yeast on sugar.

C-82 CHEMICAL REACTIONS IN HIGHER PLANTS (Colour)

Plants obtain the elements, carbon, hydrogen, and oxygen, from the air and the soil. The other essential elements are absorbed from the soils as ions in water solution. Experimental studies have shown that the oxygen produced in the photosynthesis reaction comes from the water, not the carbon dioxide.

C-83 CHEMICAL REACTIONS IN THE ANIMAL BODY (Colour)

Animals need pre-formed organic compounds — proteins, carbohydrates, fats, vitamins — as foods. Many of them are insoluble in water and, therefore, need to be transformed into compounds which can be transported to the cells by the blood.

C-84 SOME TYPICAL BIOCHEMICAL LABORATORY TESTS (Colour)

Laboratory tests are used to identify different types of biological material. They include the Molisch test for carbohydrates, the iodine test for starch, the Tollens, Fehling and Benedict tests for sugars, the osazone reaction with sugars, tests for proteins, and tests for fats. An experiment is carried out to show the relation of pH to the action of the enzyme, amylase, on starch.

C-85 STRUCTURAL PROPERTIES OF SIMPLE IONS (Colour)

In very many compounds the atoms are bonded together covalently to form molecules. In many other compounds the bonding is different. Formulas for some compounds are shown.

C-86 REACTIVITIES OF ATOMS AND THE PERIODIC TABLE (Colour)

In Lesson 85 the atoms (and their ions) in two horizontal series in the Periodic Table were compared. In this lesson comparisons are made between atoms (and their ions) in vertical columns of the Table. Some of the effects of amount of charge on ions and on the sizes of ions are shown in the melting points

and hardness of ionic compounds. The effects of charge and size are also shown by the work required to remove one or more electrons from sodium magnesium and aluminum.

C-87 A FAMILY OF ELEMENTS — THE ALKALI METALS (Colour)

The alkali metals have similar chemistries but with some differences related to atomic number and size. Some of the reactions of sodium are shown: burning, reaction with water. Reaction of lithium and of potassium with water is also shown.

C-88 THE ALKALI METALS — OXIDATION-REDUCTION (Colour)

Reactions of the alkali metals are studied. The reactions are an example of oxidation-reduction.

C-89 THE ALKALINE EARTH METALS (Colour)

The alkaline earth metals are discussed. The relative sizes of the atoms and ions are given. Molar quantities of the metals are shown. Reaction of IIA elements with oxygen is illustrated by the burning of magnesium and of calcium. Hot magnesium metal is treated with steam. Hydrogen gas and magnesium oxide are formed.

C-90 GROUPS IA AND IIA COMPARED (Colour)

The properties and reactions of Group IA and Group IIA metals are reviewed with special emphasis on similarities and differences between the groups. A problem is given to the students.

C-91 SOLUBLE AND INSOLUBLE SALTS (Colour)

The problem given in the last lesson is discussed and answered. An experiment is carried out to show how barium ions from a barium chloride solution can be removed by sulfate ions from a sodium sulfate solution to form a salt. The reaction between a barium hydroxide solution and a sulfuric acid solution is carried out.

C-92 PRECIPITATION REACTIONS (Colour)

Several precipitation reactions are carried out. For some, the student has enough information to enable him to predict what will happen. A special case is found when calcium ions and sulfate ions are mixed.

C-93 EQUILIBRIUM IN SATURATED SOLUTIONS OF SALTS — CALCIUM CARBONATE (Colour)

Precipitation is studied from the point of view of the equilibrium that exists between a solid and its dissolved ions in water solution. The Le Chatelier principle is used.

C-94 THE CHEMISTRY OF LIME (Colour)

Reactions of oxide ion with water and calcium oxide with water and the decomposition of calcium hydroxide by heat are discussed.

C-95 HARD WATER — ITS FORMATION (Colour)

An experiment is carried out showing that calcium hydroxide in water reacts with carbon dioxide to form a precipitate. The soap test is used to show that much of the hardness of temporary hard water has been removed by boiling.

C-96 HARD WATER — ITS TREATMENT ION EXCHANGE (Colour)

Temporary hard water may be softened by a base such as sodium hydroxide which neutralizes the bicarbonate ions and forms carbonate ions which then precipitate with the calcium ions present. Phosphate may also be used to remove calcium ions. Another method of softening water is by "*ion exchange*".

C-97 PRECIPITATION AND INORGANIC SYNTHESIS (Colour)

Some of the principles learned in previous lessons are applied. A method is shown for preparing calcium chloride from calcium nitrate. A precipitate of calcium carbonate is first formed and separated from the remaining solution by filtration.

C-98 WASHING SODA, SOAP AND SYNTHETIC DETERGENTS (Colour)

Reactions of sodium carbonate are discussed. It is used primarily as a source of carbonate ion. The carbonate ion may be used to precipitate many cations but it is also a base. The chemistry of soaps in water is parallel to that of sodium carbonate.

C-99 THE CHEMISTRY OF SODIUM BICARBONATE (Colour)

Sodium hydrogen carbonate is another commercial compound made in large quantities. It consists of two kinds of ions: sodium ions or hydrogen carbonate (bicarbonate) ions. Such materials as bicarbonate ions and water molecules which may react either as acids or bases are called "*amphoteric*" or "*amphiprotic*".

C-100 THE AMMONIA SODA PROCESS (Colour)

The Solvay process for making sodium bicarbonate and sodium carbonate is studied as an example of an industrial process using some of the reactions discussed in previous lessons. Some typical industrial plants and operations are shown.

C-101 EXPERIMENTS WITH ACIDIC CATIONS (Colour)

The chemistry of Be^{++} ions, Mg^{++} ions, and Al^{+++} ions is studied and compared with the chemistry of Ca^{++} ions. Differences observed are in taste, pH, reaction with sodium hydroxide and with an excess of sodium hydroxide, reaction with ammonia solution whether in excess or not, and reaction with sodium carbonite and with excess of sodium carbonate.

C-102 INTRODUCTION TO ION HYDRATION (Colour)

In Lesson 101 beryllium, magnesium, and aluminum ions were found to have properties different from those previously found for Group IA ions and none of the Group IIA ions. The special properties such as acidity and information of gelatinous precipitates are related to the small sizes of the ions and to the interaction with water. The hydration of anhydrous, colorless copper sulfate is demonstrated.

C-103 COLORS OF AQUO COMPLEX IONS — COORDINATION NUMBER (Colour)

Some of the effects observed when complex ions are formed in water solution and the behavior of the complex ions are reviewed.

C-104 RELATING STRUCTURAL AND CHEMICAL PROPERTIES — AN EXAMPLE (Colour)

Effects are illustrated with the isoelectronic ions, Na^{+}, Mg^{++}, and Al^{+++} — as size decreases and charge increases the acidity of the solution increases. The effect of decreasing size of cation is also illustrated for Ca^{++}, Mg^{++}, and Be^{++}. The similar effects of Be^{++} and Al^{+++} ions are explained in terms of their similar charge-size ratios.

C-105 GELATINOUS HYDROXIDES AMPHOTERISM (Colour)

The precipitation of hydrated aluminum hydroxide, previously studied is explained in terms of an acid-base reaction. Student problem: Explain and write the equation for the reaction between a solution of aluminum chloride and a solution of sodium bicarbonate.

C-106 THE TRANSITION METALS — AN INTRODUCTION (Colour)

The work with aquo complex ions is reviewed. The structures of some of the elements and of their ions are shown.

C-107 EXPERIMENTS WITH SOME TYPICAL TRANSITION METAL IONS (Colour)

Separate solutions of cobalt II, copper II, zinc II and silverI nitrates are examined for colors of the hydrated cations and pH of the solutions. The results are recorded in the form of a table. The reactions of the separate solutions with small amounts of some reagents and with an excess of the reagents are observed.

C-108 SOME COMPLEX IONS OF THE TRANSITION METALS (Colour)

The reactions, observed in the preceding lesson, of concentrated hydrochloric acid on solutions of aquo complex ions are studied in more detail. The hydrated copper hydroxide complex ion is compared with the corresponding aluminum complex ion. The reaction of ammonia on the hydrated complexes of cobalt, zinc, and silver ions is reviewed.

C-109 SOME APPLICATIONS OF COMPLEXING REACTIONS (Colour)

Calcium hydroxide is dissolved by addition of an acid which combines with the hydroxide ion to form water. Sodium thiosulfate is used to "*fix*" photographic film by dissolving off all undeveloped silver salts. Other complexing reactions are shown.

C-110 SOME ASPECTS OF COMPLEX ION THEORY (Colour)

Examples are given to show that the bonds between the central atom and the groups attached to it cannot be explained by ion-dipole attraction alone, by acid-base reaction alone, or by charge, or charge-size alone. Examples of the geometric shapes of complex ions are given.

C-111 A REVIEW OF VALENCE CONCEPTS — OXIDATION NUMBER (Colour)

The term valence is an old term which has had different meaning at different times. Some examples are given to illustrate the various aspects of valence.

C-112 OXIDATION NUMBER AND THE NAMING OF COMPOUNDS (Colour)

Methods of assigning oxidation numbers for hydrogen and for oxygen in compounds are reviewed and the differences between covalence, coordination number, and oxidation number are illustrated. Some rules are given for naming classes of compounds. The international system of indicating the various possible compounds is illustrated for oxides of iron and oxides of chromium.

C-113 AN INTRODUCTION TO OXIDATION AND REDUCTION (Colour)

Electron transfer in oxidation-reduction reactions is in many ways like that of proton transfer in acid-base reactions. There is an analogy between conjugate oxidizing-reducing systems and conjugate acid-base systems.

C-114 BUILDING AN OXIDATION REDUCTION TABLE (Colour)

An oxidation-reduction table is developed on the basis of experimentation. Zinc metal is treated with water, with IM hydrochloric acid solution, with IM sodium chloride solution, and with IM sulfuric acid solution. The results are interpreted and entered in the table.

C-115 A TYPICAL ELECTRIC CELL (Colour)

From the oxidation-reduction table the results of many reactions can be predicted. The predictions can be tested by experiment. The cell used is called a Daniell cell.

C-116 ELECTRIC CELLS AND THE FARADAY LAWS (Colour)

A Daniell cell is constructed. Methods are shown for calculating various quantities of substances produced when various currents flow for various times. The students are presented with a problem.

C-117 EQUIVALENT WEIGHTS OF METALS (Colour)

The reaction between zinc and hydrochloric acid is used to determine the weight of an equivalent of zinc and the charge on the zinc ion. Qualitative experiments are carried out with sodium, magnesium, and aluminum.

C-118 THE LEAD STORAGE BATTERY — THE DRY CELL (Colour)

Two commercial cells, the lead storage cell and the dry cell, are discussed. For the lead storage cell the reducing systems, the oxidizing systems, and the electrodes are described. The reactions occurring when the cell discharges and when the cell is charged are shown.

C-119 SOME CHEMICAL EXPERIMENTS WITH A DANIELL CELL (Colour)

Experiments are carried out on the familiar zinc-copper cell to show the effects of concentration charges.

C-120 OXIDATION-REDUCTION EQUATIONS (Colour)

A quantative oxidation-reduction is stated. An oxide or hydroxide coating forms and prevents reaction.

C-121 THE COPPER-SILVER ION REACTION — A QUANTITATIVE EXPERIMENT (Colour)

The experiment started in the preceding lesson is completed. A second method of deriving oxidation-reduction equations is illustrated and is shown to give the same net equation as the method of half reactions.

C-122 ELECTROLYSIS I (Colour)

In electrolysis, reactions which do not occur spontaneously can be made to occur by placing the reactants between two electrodes and pumping electrons through the cell. The charging of a lead storage battery is an example.

C-123 ELECTROLYSIS II (Colour)

The problem posed in the preceding lesson is discussed. Commercial eletroplating of silver is shown.

C-124 TYPES OF REACTIONS — A SUMMARY AND REVIEW (Colour)

In this lesson many of the chemical reactions already studied are reviewed in terms of types of reaction. Some examples are used to illustrate ideas about classification.

C-125 THE HALOGENS (Colour)

The chemistry of the halogens is studied in a systematic way. Methods for preparing chlorine gas from chloride ions are shown and ways of deriving the equations for the reactions are explained.

C-126 CHLORINE (Colour)

The laboratory preparation of chlorine gas and the bleaching action of chlorine are reviewed. The commercial process for electrolysis of brine is shown. The differences between the properties of chlorine and chloride ions are reviewed.

C-127 FLUORINE, BROMINE AND IODINE (Colour)

Fluorine is commonly found in nature as the fluoride ion in the insoluble salt, calcium fluorite. This salt is a more complex structure than sodium chloride. The structures of these salts are illustrated with crystal models. The commercial production of bromine is shown.

C-128 HALOGEN CHEMISTRY — A SUMMARY (Colour)

The reactions of the halogens and of their compounds may be summarized in terms of types of reactions studied previously. Through covalent bond exchange, each of the halogens may form covalent compounds with the other halogens.

C-129 LABORATORY EXPERIMENTS WITH HALIDE IONS — OBSERVATIONS AND INFERENCES (Colour)

A series of experiments is carried out on the silver and mercury halides. The experiments show that the strength of ammonia, thiosulfate ion, and cyanide ion as complexing agents for silver ion increase in order given. Reactions are carried out to form red mercuric iodide precipitate which dissolves in an excess of mercuric ions or of iodide ions.

C-130 THE SULFUR FAMILY (Colour)

Several forms of crystalline sulfur are shown. A rubbery form of sulfur is formed by heating liquid sulfur to a high temperature and then chilling it suddenly. Sulfur is found naturally as free sulfur, in gaseous hydrogen sulfide and sulfur dioxide, and more commonly in metallic sulfides.

C-131 HYDROGEN SULFIDE — METAL SULFIDES (Colour)

Hydrogen sulfide is a poisonous gas. Its structure is like that of water. Several methods for preparing hydrogen sulfide and some of the properties of hydrogen sulfide are demonstrated.

C-132 SULFUR OXIDES — SULFURIC ACID (Colour)

Sulfur dioxide molecules have a bent structure similar to that of ozone. Their electron structure is shown. The operation of a commercial contact process plant is shown. Some of the properties of sulfuric acid are shown.

C-133 NITROGEN — AMMONIA AND NITRIC ACID (Colour)

The nitrogen family Group VA shows the same trends as the sulfur family and the halogen family. Ammonia is made synthetically from nitrogen and hydrogen by the Haber process. The oxidation of ammonia over a hot platinum catalyst yields nitrogen monoxide which can be further oxidized and treated with water to form nitric acid.

C-134 PHOSPHORUS AND ITS COMPOUNDS (Colour)

Phosphorus is the most abundant of the Group VA elements. Elemental phosphorus is prepared at high temperature from calcium phosphate. Other members of the phosphorus family are discussed briefly.

C-135 SILICON, SILICA, AND SILICATES (Colour)

Silicon is the second most abundant element (after oxygen) but in bulk or volume oxygen predominates because its atoms are larger than silicon atoms. Asbestos, mica, talc, and feldspars are discussed as examples of the effect of structure.

C-136 SOME APPLICATIONS OF SILICATE CHEMISTRY (Colour)

The large polymeric groups in quartz and in silicates make them high melting, viscous when liquid, and difficult to crystallize. Some of the special properties of silica gel are shown. The silicones are also described.

C-137 METALS AND METALLURGY I — SOME NATIVE METALS (Colour)

A list of fourteen metals arranged in order of decreasing reactivity is considered first, and organized into three groups; the very reactive metals, the moderately reactive metals, and the least reactive metals. The least reactive metals in the list are considered in this lesson.

C-138 METALS AND METALLURGY II — THE MODERATELY REACTIVE METALS (Colour)

Zinc, iron, tin, and lead are considered briefly, together with copper and mercury from Lesson 137. Electrorefining is illustrated by use of copper.

C-139 METALS AND METALLURGY III — THE VERY REACTIVE METALS (Colour)

Experiments are done to show that amalgam of aluminum reacts quite readily with atmospheric oxygen. A visit is made to an aluminum plant and commercial production shown.

C-140 IRON (Colour)

A series of lessons on the chemistry of iron is begun with this lesson. These will serve as a review of many of the principles of chemistry developed in the course. Loss of magnetism is demonstrated by heating a nail in the field of a permanent magnet. This same effect is demonstrated by heating a spring wire electrically and at the same time the expansion and contraction of the wire is shown at this transition point.

C-141 STEEL — ALLOYS (Colour)

The chemistry of the steel process is described. Alloys may be classified as eutectic, interstitial, substitutional, and compound. All of these types are discussed and the last three illustrated with a model made of close packed spheres.

C-142 IRON — SOLUTION CHEMISTRY I (Colour)

This lesson will begin a discussion of some typical reactions of iron and its ions. The specific reactions will be introduced for the first time but they will involve reaction types and principles already introduced.

C-143 IRON — SOLUTION CHEMISTRY II (Colour)

In the preceding lesson it was shown that iron ions show a "dual personality," undergoing both acid-base and precipitation reactions. In this lesson the study of the reactions of the ions $Fe(H_2O)6^{++}$ and $Fe(H_2O)6^{+++}$ is extended.

C-144 IRON — CORROSION (Colour)

To demonstrate corrosion a series of demonstrations involving iron nails, washers and other hardware which have been allowed to corrode in an agar gel containing phenolphthalein and dissolved potassium ferricyanide, are shown. Effects of greasing iron, plating it with copper or tin, or plating it with zinc are also shown. Galvanic protection of iron is emphasized and demonstrated.

C-145 THE PACKING OF SPHERES — SIMPLE SOLID STRUCTURES (Colour)

Tennis balls are used in this lesson to demonstrate the structural features of the packing of spheres. Two types of closest packing are shown. The structure of some simple salts, ionic compounds of formula MX (e.g., table salt, NaCl) are indicated.

C-146 MEASURING THE SIZE OF A MOLECULE — AN EXPERIMENT (Colour)

In this lesson one of the classical experiments of surface chemistry is demonstrated. The experiment consists of spreading out on the surface of clean water a thin film of the fatty acid, stearic acid. One end of the stearic acid molecule is thought to stick into the water, the rest of the molecule sticking up into the air.

C-147 UNITS, SIGNIFICANT FIGURES — LARGE AND SMALL NUMBERS (Colour)

In this lesson attention will be directed to units, significant figures, and the use of powers of ten in expressing very large or very small numbers. Advantages are pointed out and some examples shown.

C-148 DETERMINING STRUCTURES — A SIMPLE APPROACH (Colour)

One of the striking developments of this century has been the use of x-rays to establish the arrangement of atoms, molecules, and ions in crystals. An analogy in two dimensions is presented in this lesson. A powder camera used in x-ray diffraction studies is shown. The x-ray diffraction patterns for five different substances taken in such a camera are shown. Models of some common atomic and ionic substances are also shown.

C-149 RADIOACTIVITY AND RADIOCHEMISTRY I (Colour)

Some of Becquerel's work and that of the Curies and Rutherford is reviewed. A gas discharge tube is demonstrated. A luminous clock dial and a radioautograph made with it are shown. Two experiments involving radioactive "tracers" are begun. A precipiate of lead iodide, PbI_2, is formed which will be studied in the next lesson.

C-150 RADIOACTIVITY AND RADIOCHEMISTRY II (Colour)

The lead iodide precipitated in the last lesson is filtered, the solid tested with a Geiger counter and found to contain most of the radioactivity. The students are given a problem. Radioactivity, fission, fusion and chemical change are contrasted.

C-151 THE CHEMISTRY OF PHOTOGRAPHY (Colour)

The photographic process is considered in five steps, preparation of the light sensitive emulsion, exposure, development, fixing, and printing. An experiment is done in which the developing of a print in a dark room is simulated.

C-152 PLANNING A CAREER — COURSES, COLLEGE, CHEMISTRY (Colour)

This lesson is devoted to encouraging students to prepare themselves for college. Special mention is made of mathematics and foreign language. It is suggested that the student write now to the college of his choice to find their entrance requirements. A typical program in college for the chemistry major is outlined and discussed. A series of publications devoted to careers in science and engineering is shown. A visit is made to the research laboratories of an industrial chemical plant to see a research chemist at work.

C-153 CHEMISTS AT WORK I (Colour)

In this lesson we visit a pilot plant of a major oil company; a chlorine plant, a gas analysis laboratory, a silver plating company, a pharmaceutical house, and a large laboratory operated for the United States Atomic Energy Commission. A plea is made to the student to consider teaching as a career.

C-154 CHEMISTS AT WORK II — SOME SPECIAL INSTRUMENTS (Colour)

This lesson centers around special instruments. The instruments are the electron microscope, the infrared spectrophotometer, the ultracentrifuge, the emission spectrograph, the torsion balance, the recording microphotometer, the high temperature microscope, the Van de Graaff particle accelerator, the nuclear magnetic resonance apparatus. The student is encour-

aged to investigate further, any of these instruments of interest to him.

C-155 COLLOIDS (Colour)

The types of colloidal systems considered in this lesson are sols, emulsions, gels, and aerosols. The student is given the problem of calculating the tremendous increase in surface when a cube, one centimeter on an edge, is cut a million times in each of the three dimensions, giving particles of colloidal size. As a demonstration of a large surface, foam is prepared and used to smother an organic chemical fire which is not extinguished by water.

C-156 QUALITATIVE ANALYSIS I — INTRODUCTION, TESTS (Colour)

This lesson begins a series of four lessons devoted to some aspects of qualitative analysis. They are meant to be a review of the kinds of chemical reactions studied in the course, with some specific applications being pointed out.

C-157 QUALITATIVE ANALYSIS II — SEPARATIONS (Colour)

In making tests the chemist is especially interested in precipitates from solution and colors or color changes for these are easily observed. The student is given a problem in deduction from observations.

C-158 QUALITATIVE ANALYSIS III — LEAD (I) SILVER (I) AND MERCURY (I) IONS (Colour)

If one wishes to analyze for a large number of ions he must proceed in a carefully worked out systematic fashion. The chloride ion will precipitate lead (II), silver (I), and mercury (I) as chlorides. The experimental part of the lesson is devoted to this so-called Group One. An "unknown" solution is tested for the three ions in Group One, applying the tests developed in the lesson.

C-159 QUALITATIVE ANALYSIS IV — ALUMINUM (III) CHROMIUM (III) AND IRON (III) IONS (Colour)

This final lesson in the series dealing with qualitative analysis will be devoted to a study of selected members of "Group Three" of the traditional qualitative analysis scheme of cation analysis. The selected members are aluminum (III), chromium (III) and iron (III).

C-160 SUMMARY — WHAT OF THE FUTURE? (Colour)

The major principles, ideas and concepts developed during the course are summarized. The main concern of the course has been the fundamental principles of chemistry rather than a comprehensive coverage of facts.

Science — General

SG-116 BIRTH AND DEATH OF MOUNTAINS (Colour) 11 MINS.

Although mountains appear permanent, they are ever changing. Wind, water, and ice destroy mountains. At the same time, underground forces are constantly at work building mountains up.

SG-117 BUILDING A JET PLANE (Colour) 11 MINS.

The film stresses the co-operative effort of the many skilled men and women who work together to build a jet plane. We follow a jet plane from original planning through parts manufacture, sub-assembly, final assembly, ground testing, and flight testing. Finally, it is sold to an airline company.

SG-118 CAVERNS AND GEYSERS (Colour) 16 MINS.

The film illustrates how underground water is constantly changing our earth, forming both caverns and geysers. The mechanism of cavern and geyser formation is illustrated.

SG-119 THE COMPASS 11 MINS.

In the classroom, the teacher explains the meaning of "direction" and demonstrates the function of the compass. The film then illustrates the practical application of information learned in school, as one of the students puts his knowledge to good use in an emergency.

SG-120 THE EARTH IN CHANGE (Colour) 16 MINS.

This film tells the story of the changing land features of our planet. The ways in which ice, wind, and water act to wear away the surface of the earth, and how sedimentation, the action of volcanoes and earthquakes, and other forces help to build it up, are carefully described and illustrated. Scenes of Glacier National Park, Vesuvius and Paricutin volcanoes, and other rich geologic sources throughout the world contribute to a real understanding of the dynamic processes that change the surface of the earth.

SG-121 ELECTROMAGNETS (Colour) 11 MINS.

Explains the theory of electromagnetism by means of simple equipment and demonstrations, and shows how the electromagnet is used in the doorbell, the telegraph, and many other everyday applications.

SG-122 FIRE SCIENCE 15 MINS.

An introduction to the chemistry of combustion. Visualizes the molecular action of a burning fuel as it releases energy in the

form of heat and light. Experiments explain the concepts of fuel, oxidation, kindling temperature and spontaneous combustion. Highlights uses of fire in historical times and today. Animation.

SG-123 FIRST MEN INTO SPACE (Colour) 15 MINS.

This film ilustrates the problems attending man's survival in outer space. It shows how these space survival problems were scientifically studied and solved in ground laboratories and how the solutions were applied by engineers to the first space capsule. By re-creating with models, animation, and live photography, it shows the first American orbital space flight and how the solutions to the problems of man's survival in outer space have worked out in actual practice.

SG-124 FRICTION AND ITS EFFECTS (Colour) 11 MINS.

Friction can help us or hinder us, depending on how it is used and controlled. We are shown that when objects rub together, friction is produced — a resistance to movement, which causes heat and wear. Ilustrated are the effects, uses, and disadvantages of friction, and methods of controlling it.

SG-125 LEARNING ABOUT LIGHT 8 MINS.

Deals with the fundamental concepts in the study of light such as which objects are luminous; when are objects transparent, translucent, or opaque; what is reflection; and what is refraction.

SG-126 LEARNING ABOUT SOUND 8 MINS.

Whether loud or soft, high or low, sound is made by vibration — of a string, a taut surface or a column of air — and travels in waves. We are aware of sounds because the vibrations reach our ears and the hearing nerves carry their message to the brain.

SG-127 OUR WORLD OF SCIENCE 11 MINS.

Explains what science is and how we learn about science. Introduces and defines the words "science" and "experiment", and demonstrates a simple experiment which second graders can do. Develops the idea of an orderly universe and shows a clear-cut working procedure for problem solving in science.

SG-128 STORY OF MAGNETISM (Colour) 14 MINS.

The purpose of this film is to help develop more completely the pupils' understanding of the nature of magnetism, with special attention to the relationships between magnetism and electric-

ity. The student learns of the vital importance of the work being done in this area of science as it applies to the work and life of the world.

SG-129 VOLUME AND ITS MEASUREMENT (Colour) 11 MINS.

Using three-dimensional plastic models, this film demonstrates basic principles in measuring volume, and graphically illustrates the meaning of cubic units of measure. Volumes of prisms, pyramids, cylinders, and cones are found both by actual measurement and by the use of mathematical formulae. Practical applications for the use of these formulae are indicated.

SG-130 WHAT IS SO IMPORTANT ABOUT A WHEEL (Colour) 10 MINS.

The film describes the relationship of the wheel to man's progress and challenges students to observe wheels more keenly.

SG-131 WHAT MAKES DAY AND NIGHT 8 MINS.

Demonstrates that alternation of day and night is due to the rotation of the earth on its axis, and that it always is daytime on some part of the earth.

SG-132 WHICH WAY IS NORTH? (Colour) 14 MINS.

A freighter at sea, a jet airliner heading for a distant city, a patrol of Boy Scouts hiking back to camp — all are dependent on direction-finding in order to reach their destination. For thousands of years, men have devised different ways of locating north. After they had determined north, they could orient themselves correctly. With the development of the compass, however, travellers had to adjust their methods of direction-finding, for the compass needle does not point to true north — it points to magnetic north.

SG-133 YOU AND MACHINES (Colour) 13½ MINS.

The purpose of this film is to help pupils comprehend the importance of machines by explaining how energy is controlled and directed to do work. The uses of levers, inclined planes, wheels, axles, gears, and pulleys are all demonstrated. In this machine age, increased force, increased speed, and transmission of energy are essential to meet the ever growing demands of our way of life.

Science—Natural

SN-206 ANIMALS OF PREHISTORIC AMERICA (Colour) 15 MINS.
Motivated by the interest of two children, a paleontologist explains how the development of animal and plant life on earth is interpreted from fossil remains. The changing forms of animal life over the past billion years, from simple invertebrates to modern mammals, are shown by means of fine picture reconstructions and animated models.

SN-207 ANIMALS PROTECT THEMSELVES (Colour) 11 MINS.
Billy, his father, and Snooper his dog take a walk through the woods and discover some of the ways animals have of protecting themselves from their enemies. Billy learns that some animals protect themselves by running very fast, others by their coloration, and still others by their structure. Some animals, such as the skunk, have quite unique and effective defense mechanisms. We see many of the more common animals, and observe the way they are adapted for protection.

SN-208 ANIMALS SEE IN MANY WAYS (Colour) 11 MINS.
The film illustrates the differences in the eyes of various animals — from the simple eyes of an insect to the complex eyes of a backboned animal. The kind and position of an animal's eyes is often a clue to the animal's way of life.

SN-209 BIG GREEN CATERPILLAR, THE (Colour) 11 MINS.
A boy finds an insect egg which he observes throughout the process of hatching of the insect, and its later development. The purposes of the film illustrate how an animal adapts to its environment, shows the life-cycle of an insect, motivates an interest in science and stimulates a greater awareness of the interesting things in nature that are available to all children.

SN-210 BIRDS AND THEIR CHARACTERISTICS (Colour) 11 MINS.
This film shows in detail the characteristics which differentiate birds from the other groups of vertebrates. Features which all birds have in common are shown — feathers, wings and legs, warm-bloodness, and beaks. We learn of the adaptations and special characteristics of several kinds of familiar birds. Unusual slow-motion photography shows details of a bird's flight.

SN-211 FALL BRINGS CHANGES (Colour) 11 MINS.
The adaptation of plants and animals to colder weather is shown. Both films are also most useful as a teacher's aid in the area of Language Arts. They are beautiful and poetic and will

inspire many stories to enrich the child's imagination and vocabulary.

SN-212 FISH AND THEIR CHARACTERISTICS (Colour) 11 MINS.

Through underwater photography we are introduced to the characteristics of fish and shown how this group of vertebrates is fitted for its environment. The film illustrates the variety of form, protective devices, and reproductive methods in different types of fish. True fish are distinguished from other marine animals. The freshwater perch is studied as a representative fish.

SN-213 HOW SUNSHINE HELPS US (Colour) 11 MINS.

Because Jack is sunburned, he thinks it would be better if there weren't any sunshine. But he learns that sunshine gives us light and warmth, and makes rain for plants to grow — giving us food.

SN-214 INTRODUCING INSECTS: BUTTERFLIES, BEETLES AND BUGS (Colour) 17 MINS.

Creatures of the insect world are divided into several groupings. Special camera techniques, magnified close-ups, and slow-motion photography clearly show distinguishing characteristics and patterns of behaviour. From the tiny flea to the giant Goliath beetle this film presents a colourful glimpse of the complexity of these forms of animal life.

SN-215 LIVING MAMMALS, THE (Colour) 17 MINS.

Defining a mammal in biological terms, "The Living Mammal" shows characteristics held in common by all mammals and presents the various ways in which mammals have adapted themselves to life in the air, in the water, in tree tops and on the ground. Sequences examine the highly developed senses of sight, smell, touch and hearing and show how these are combined in the hunt for food. The adaptations of teeth for herbivorous, carnivorous and omnivorous modes of life are shown. Diverse means of self-protection are portrayed.

SN-216 MOTHER CAT AND HER BABY SKUNKS (Colour) 11 MINS.

In northern California, while preparing to photograph a story about a skunk family, the cameraman chanced upon an unusual situation, A mother cat had adopted some orphaned baby skunks! Children in nursery school, kindergarten, and primary grades classes in language arts and nature study will find this film a rich learning experience. It also has applications for social studies units on family living.

SN-217 THE POND (Colour) 20 MINS.

In extreme close-up colour photography and synchronized natural sound, life forms above and below the surface of the water are observed in action. Wild flowers and plants provide food and shelter for an abundant animal life — invertebrates, fish amphibians, reptiles, birds and mammals. Each member of this total community is studied as it affects all other members in this dramatic relationship.

SN-218 SPRING BRINGS CHANGES (Colour) 11 MINS.

In spring, when the sun warms the earth, the world comes alive. Farmers plow their fields and Faith and Mark plant a vegetable garden. Beautiful nature photography compresses in time a wealth of changes in plants and animals, changes that occur so gradually that they are difficult for the child to grasp.

SN-219 WATER AND WHAT IT DOES (Colour) 11 MINS.

Water is made up of molecules in constant motion. This film demonstrates the changes which occur when substances are dissolved, and the effects of temperature changes. The transitions from a liquid to a gas, and to a solid are clearly illustrated.

SN-220 WE EXPLORE THE FIELD AND MEADOW (Colour) 11 MINS.

On a bright, beautiful morning we take a walk into the field and meadow with Wayne and Kathy. We see many of the plants and animals that live there — wild roses, red clover, grasses, bumblebees, grasshoppers, birds, rabbits and snakes — and we learn that these living things depend upon one another for their needs within the meadow environment.

SN-221 WHAT DO WE SEE IN THE SKY (Colour) 11 MINS.

Freddie's curiosity about things he sees in the sky leads him to learn about the sun, moon, planets, stars, and constellations — their relative sizes and distance from the earth, their light, and something of their composition. While learning about the sky, he comes to appreciate its beauty and wonders.

SN-222 WHAT'S ALIVE 11 MINS.

Helps the student toward an understanding of the activities that distinguish living from non-living things. Defines things in terms of a set of activities.

SN-223 WOODCOCK, THE (Colour) 6 MINS.

The viewer has an opportunity to observe birds' plumage patterns, actual camouflage, nesting and feeding habits and several interesting methods which the woodcock uses to protect the eggs and young birds from enemies.

Physics Series

Call No.

P-1 PHYSICS, AN EXACT SCIENCE (Colour)
Introduces the various branches of physics usually covered in a one year course and demonstrates each.

P-2 OPTICAL ILLUSIONS (Colour)
Compares and demonstrates subjective and objective methods of measurement principally through optical illusions.

P-3 UNITS OF MEASUREMENT (Colour)
Defines and demonstrates fundamental and derived units of measurement.

P-4 MEASUREMENT OF DISTANCES AND ANGLES (Laboratory)
Illustrates use of the metric system and demonstrates measurement of lines and angles.

P-5 SLIDE RULE
Teaches beginners by demonstration.

P-6 ALGEBRA AND POWERS OF TEN
Explains simple algebraic equations and use of powers of ten with particular emphasis on their use in physics.

P-7 TRIGONOMETRY
Introduces sine, cosine, and tangent functions applied to a right triangle.

P-8 SPEED AND VELOCITY
Introduces velocity, and instantaneous velocity.

P-9 SPEED AND VELOCITY (Laboratory)
Distance and time measurements on small car and train. Data recorded.

P-10 ACCELERATED MOTION (Colour)
Provides formulas and demonstration experiments illustrating uniformly accelerated motion.

P-11 ACCELERATED MOTION (Laboratory)
Steel ball rolls down incline plane. Measurements made and data recorded.

P-12 COMPOSITION OF VELOCITIES
Demonstrates vector aspects of velocity by considering simultaneous velocities.

P-13 RESOLUTION OF VELOCITIES
Velocity as a vector quantity is resolved into two components. Demonstration model used.

Call No.

P-14 FALLING BODIES

Kinematics of freely falling bodies treated. Demonstrations of falling bodies in vacuum and in air.

P-15 FALLING BODIES (Laboratory)

Measures time and distances for freely falling bodies with high precision. Data recorded.

P-16 NEWTON'S FIRST LAW OF MOTION (Colour)

Demonstration experiments to illustrate concepts of inertia.

P-17 PROJECTILES (Colour)

Demonstrates laws relating to projectiles. Vertical and horizontal projection treated in detail.

P-18 PROJECTILES (Laboratory)

Heights and ranges of projectiles are measured for different elevation angles. For class participation.

P-19 NEWTON'S SECOND LAW OF MOTION

Uniformly accelerated motion demonstrated by small car. Kinematics of motion given.

P-20 THE FORCE EQUATION (Laboratory)

Acceleration of small car measured. For class participation.

P-21 NEWTON'S LAW OF GRAVITATION AND THIRD LAW OF MOTION (Colour)

Formulates both laws and presents demonstrations.

P-22 BALANCED AND UNBALANCED FORCES

Principles of composition of forces presented and demonstrated.

P-23 CONCURRENT FORCES (Laboratory)

Measures magnitudes and direction of forces. Data recorded.

P-24 RESOLUTION OF FORCES

Single forces applied to bodies are resolved into components. Principles are illustrated by experiments.

P-25 RESOLUTION OF FORCES (Laboratory)

Force components on small loaded car are measured and recorded for class use.

P-26 ROTATIONAL EQUILIBRIUM

Applies sets of forces to rigid body and establishes translational and rotational equilibrium.

Call
No.

P-27 PARALLEL FORCES (Laboratory)
Uses two beam balances and a set of weights to apply forces at different points along a meter stick. Measures forces and distances as a class participation experiment.

P-28 CENTRE OF MASS AND CENTRE OF GRAVITY (Colour)
Presents principles and demonstrations of centre of mass and centre of gravity in simple form.

P-29 THE SIMPLE CRANE (Laboratory)
Forces in the tension and compression of members of a crane are measured and recorded.

P-30 EQUILIBRIUM OF RIGID BODIES
Treats and demonstrates forces and torques acting on rigid bodies in equilibrium.

P-31 FRICTION
Treats and demonstrates principles of sliding and rolling friction under various experimental conditions.

P-32 COEFFICIENT OF FRICTION (Laboratory)
Provides measurements of sliding and rolling friction for several different materials and records data.

P-33 STREAMLINING
Laminar flow and turbulent flow are treated and demonstrated with models.

P-34 WORK AND ENERGY
Principles of work and energy are formulated and demonstrated by models.

P-35 CENTRE OF GRAVITY (Laboratory)
Combinations of regular shaped bodies are balanced and then set into rotation. Data recorded for class use.

P-36 ENERGY AND POWER
Principles of kinetic energy and power are treated and demonstrated by mechanical models.

P-37 HORSEPOWER (Laboratory)
The horsepower of an electric motor is measured. Class records data.

P-38 CONSERVATION OF ENERGY
Energy conservation as applied to kinetic and potential energy explained with experimental demonstrations.

P-39 CONSERVATION OF MOMENTUM
Principles of impact, force, impulse, and momentum are developed and demonstrated by experiments.

Call
No.

P-40 ENERGY AND MOMENTUM (Laboratory)

Forces involved in driving a nail into a block of wood are measured and recorded by class.

P-41 LEVERS

Principles of first, second, and third class levers are given with several demonstrations for each.

P-42 LEVERS (Laboratory)

First, second, and third class levers are set up, and applied equilibrium forces are measured.

P-43 ANATOMICAL MECHANICS

Principles of mechanics are applied to the human body. Working models are shown.

P-44 MACHINES

Principles of levers, wheels, pulleys, gears, and combinations of same are explained and demonstrated.

P-45 BALLISTICS (Laboratory)

Impulses for various rifle bullets are measured, and muzzle velocities determined. Class observes and records data.

P-46 CIRCULAR MOTION

Principles of rotation, centripetal, and centrifugal forces are presented and demonstrated by numerous experiments.

P-47 CENTRIPETAL FORCE (Laboratory)

Centripetal forces acting on rotating mass are measured with different speeds and compared with theory.

P-48 DYNAMICS OF ROTATION

Angular acceleration of rigid bodies in rotation is visually demonstrated.

P-49 CONSERVATION OF ANGULAR MOMENTUM

Internal changes within rotating bodies are applied to mechanical models demonstrating conservation laws.

P-50 MOMENT OF INERTIA (Laboratory)

Angular accelerations of several regularly shaped bodies are measured and their moments of inertia determined.

P-51 ATOMIC THEORY OF MATTER (Colour)

Atoms and molecules, as they exist in solids, liquids, and gases, are explained with models.

Call
No.

P-52 ELASTICITY (STRESS, STRAIN, YOUNG'S MODULUS)
The elasticity of solids, as defined by Hooke's Law and Young's Modulus, is introduced and explained.

P-53 HOOKE'S LAW (Laboratory)
Measurements on a stretching of a wire are made, Hooke's Law is demonstrated, and Young's Modulus is determined.

P-54 BENDING, TWISTING, AND BOUNCING (Colour)
Elastic properties of solids and Hooke's Law are demonstrated by the bending of beams, twisting of rods, and the bouncing of solid spheres.

P-55 PRESSURE IN A LIQUID
Pressure in a liquid, density of liquids, the concepts of pressure and density, as they pertain to water, are explained and demonstrated.

P-56 PRESSURE IN LIQUIDS (Laboratory)
Liquid pressure is measured at various depths in fresh water and comparisons are made.

P-57 ARCHIMEDES' PRINCIPLE
Principles of buoyancy, as applied to floating and submerged objects are explained and demonstrated.

P-58 DENSITY AND WEIGHT DENSITY (Laboratory)
Density and weight density of five solids are determined experimentally.

P-59 SURFACE TENSION
The phenomenon of surface tension in liquids is explained and demonstrated by numerous experiments.

P-60 THE ATMOSPHERE
The physical properties of the earth's atmosphere are discussed. Atmospheric applications of the principles are shown.

P-61 WEIGHING THE AIR (Laboratory)
A volume of air is measured and weighed, and density of air is determined.

P-62 FLUIDS IN MOTION
Torricelli's Theorem is explained. Fluid friction and viscosity, as applied to fluids in motion, are discussed and demonstrated.

P-63 FLUID FRICTION (Laboratory)
The velocity head, friction head, and pressure head, as applied to water flowing through a pipe, are measured.

Call
No.

P-64 BERNOULLI'S PRINCIPLE (Colour)

Many apparent paradoxes, as they apply to flight, the curve of a pitched ball, etc. are explained and demonstrated as illustrations of Bernoulli's Principle.

P-65 VIBRATIONS AND WAVES

Period, frequency, and amplitude of vibration objects, as they pertain to wave motion in general, are introduced and demonstrated.

P-66 THE PENDULUM (Laboratory)

The periods of several simple pendulums are measured, and the acceleration due to gravity is calculated.

P-67 TEMPERATURE AND EXPANSION

Various methods of measuring temperature are demonstrated by means of mercury thermometers, electrical resistance, thermometers and thermopiles. The thermal expansion of solids is demonstrated.

P-68 THERMAL EXPANSION (Laboratory)

The temperature of different metal rods is raised and the resulting expansion measured.

P-69 HEAT CAPACITY AND CHANGE OF STATE

The concepts of specific heat, thermal capacity, and their relation to changes from solids to liquid to gaseous states are discussed and demonstrated.

P-70 HEAT TRANSFER (Colour)

Heat transfer by conduction through solids and convection by liquids and gases is demonstrated.

P-71 SPECIFIC HEAT (Laboratory)

Specific heat and thermal capacity of a metal are determined by calorimetry.

P-72 RADIANT HEAT

Transfer of heat by radiation is demonstrated. Kirchhoff's radiation laws and Prevost's law of heat exchange are discussed.

P-73 LATENT HEAT OF FUSION (Laboratory)

The heat required to melt a measured quantity of ice is determined by calorimetry.

Call
No.

P-74 CHANGE OF STATE

The effect of pressure on the melting point of ice, the absolute and relative humidity of the atmosphere, and the general effects of pressure on the melting and boiling points are demonstrated.

P-75 REFRIGERATION AND GEYSERS (Colour)

The general principles of refrigeration are presented. Water simultaneously boiling and freezing at the same temperature is shown. An actual periodically spouting geyster demonstrates the effect of pressure on the boiling point of water.

P-76 NEWTON'S LAW OF COOLING (Laboratory)

Cooling curves of two cups are determined, under different initial and final conditions, as demonstration of Newton's Law of Cooling.

P-77 HEAT ENERGY AND GAS LAWS

Transformation of mechanical energy into heat, mechanical equivalent of heat, the general gas law, Boyle's Law, Charles' Law are explained.

P-78 MECHANICAL EQUIVALENT OF HEAT (Laboratory)

Mechanical energy is transformed into heat energy by means of a motor-driven drum, and the mechanical equivalent of heat is determined.

P-79 LIQUID AIR (Colour)

Low temperatures are discussed, the liquification of air is explained, and the changes of physical properties of solids and liquids, cooled to liquid air temperatures, are demonstrated.

P-80 HEAT ENGINES

The principles of the steam engine, internal combustion engines, gas turbines, and rocket engines are demonstrated.

P-81 BOYLE'S LAW (Laboratory)

The pressures on a fixed mass of air at different volumes, but at constant temperature, are measured, thereby demonstrating Boyle's Law.

P-82 SOUND WAVES

Experimental demonstrations of simple harmonic motion, transverse and longitudinal waves, pitch, frequency, and speed of sound are given.

Call
No.

P-83 FREQUENCY OF TUNING FORK (Laboratory)

Vibograph method is used to measure the frequency of a tuning fork. Class observes and records data.

P-84 RESONANCE, BEATS AND DOPPLER EFFECT

Experimental demonstrations of tuning forks in resonance, significance of beat notes, and explanation of Doppler effect given.

P-85 VIBRATING STRINGS (Laboratory)

Standing waves on a vibrating string are measured in terms of frequency, wave length, and wave velocity.

P-86 VIBRATING STRINGS AND AIR COLUMNS (Colour)

Relations between frequency, velocity, wave length, amplitude, and wave motions as they apply to standing transverse waves explained.

P-87 WIND AND PERCUSSION INSTRUMENTS

Demonstrations of vibrating air columns, organ pipes, reed mouthpieces, xylophone, bars, bells, and cymbal plates.

P-88 RESONATING AIR COLUMNS (Laboratory)

Standing longitudinal waves produced in a vibrating air column are measured.

P-89 SOUND ENERGY AND HEARING

Demonstrations of sound energy, its relation to loudness, decibels, the Inverse square law, and the human ear as a detector are given.

P-90 THE SCIENCE OF THE MUSICAL SCALE (Colour)

Vibration frequencies of the diatonic, chromatic, and equal tempered scales are described along with chords, harmony, and dissonance.

P-91 SPEED OF SOUND (Laboratory)

Standing longitudinal waves in vibrating gas columns are measured and speed of sound in air and other gases is determined.

P-92 THE QUALITY OF MUSICAL SOUNDS

Relationship between fundamentals and harmonics as they pertain to quality of musical instruments and the human voice is demonstrated.

P-93 THE NATURE OF LIGHT (Colour)

Sources of light, straight line propagation, pin hole camera, and speed of light are explained and illustrated.

Call
No.

P-94 LIGHT SOURCES AND ILLUMINATION (Colour)

Introduction to inverse square law. The principles of photometry as a means of determining intensity of light sources, luminance, and illuminance are presented.

P-95 PHOTOMETRY (Laboratory) (Colour)

Intensities of a number of light sources are determined by using a photometer.

P-96 REFLECTION FROM PLANE SURFACES (Colour)

The law of reflection, both internal and external, from glass as well as water surfaces, is demonstrated by a number of different experiments.

P-97 REFLECTION FROM PLANE SURFACES (Laboratory) (Colour)

The law of reflection is demonstrated by means of objects and their images as reflected in a plane mirror.

P-98 REFLECTION FROM CURVED SURFACES (Colour)

The image-forming properties of concave mirrors are demonstrated and the object-image formula is introduced.

P-99 REFRACTION OF LIGHT (Colour)

Refraction of light at smooth glass and water surfaces is demonstrated. Snell's Law is introduced. Deviation of light by prisms having different angles is demonstrated.

P-100 INDEX OF REFRACTION (Laboratory) (Colour)

The Hartl Disc is used to measure angles of incidence and corresponding angles of refraction for the purpose of verifying Snell's Law.

P-101 LENSES (Colour)

The principles of converging and diverging lenses are introduced. The object image formula is demonstrated as well as conjugate foci, real and virtual images.

P-102 STUDY OF LENSES (Laboratory) (Colour)

The focal lengths of several converging lenses are determined, and the object and image distances for several arrangements of lenses are measured.

P-103 DISPERSION (Colour)

The total reflection of light and internal reflection at glass and water surfaces are introduced and demonstrated. Also, the dispersion of white light into its spectrum is illustrated.

Call
No.

P-104 COLOUR (Colour)

The principles of the additive method of colour mixing are illustrated by coloured lights, and the principles of subtractive colour mixing are demonstrated by colour pigments.

P-105 MAGNIFYING POWER OF A LENS (Laboratory) (Colour)

The images of small objects, as seen through lenses of short focal length, are measured.

P-106 THE EYE AND OPTICAL INSTRUMENTS (Colour)

The lens systems of cameras, telescopes, microscopes are introduced. Optical defects of the nearsighted and farsighted eye, and means of correcting such defects, are explained and demonstrated.

P-107 PRINCIPLES OF THE MICROSCOPE (Laboratory) (Colour)

Magnified images of small objects, as seen by two lenses simulating a microscope, are measured. Focal lengths, object distances, and image distances are measured.

P-108 DIFFRACTION AND INTERFERENCE (Colour)

The diffraction of light, around small objects by a double slit, and by a diffraction grating, is presented in detail, and in each case, is demonstrated by an experiment.

P-109 POLARIZATION OF LIGHT (Colour)

Polarization of light by reflection, by double refraction in calcite and by polaroid is introduced and demonstrated.

P-110 RAINBOWS, BLUE SKIES AND RED SUNSETS (Colour)

Principles of the primary and secondary rainbow are presented and demonstrated. Halos around the sun and moon are discussed. The blue sky and red sunset are explained and demonstrated by a single experiment.

P-111 ELECTRICITY AT REST

Demonstration experiments of static electricity and forces between electrically charged bodies are given. Electroscopes and electrometers are demonstrated.

P-112 COULOMB'S LAW — ELECTROSTATICS

Law of forces between electrical charges is discussed. Charging by induction and discharging by points are demonstrated.

P-113 ELECTRICITY IN MOTION (Colour)

Principles of the voltaic cell, battery cells in general, the dry cell, and storage battery are presented with demonstrations.

Call
No.

P-114 ELECTROMOTIVE FORCE OF A BATTERY CELL (Laboratory)
The electromotive force of battery cells, composed of different electrolytes and electrodes is measured.

P-115 OHM'S LAW
Relation between voltage, current, and resistance is demonstrated and treated in detail.

P-116 SERIES CIRCUITS (Laboratory) (Colour)
Law is applied to combinations of resistors connected in series.

P-117 PARALLEL CIRCUITS
Ohm's Law and Kirchhoff's Law are demonstrated by combinations of resistors connected in parallel.

P-118 THE ELECTRIC FIELD AND POTENTIAL
Definitions and the meanings of electrical potential, potential differences, electrical field, and intensity are explained and demonstrated.

P-119 PARALLEL RESISTANCES (Laboratory) (Colour)
The current through, and potential differences across, resistors connected in parallel are measured. Ohm's Law and Kirchhoff's Law are applied.

P-120 CAPACITANCE
The principles of capacitance and the construction of fixed variable capacitors are presented and demonstrated.

P-121 THE POTENTIAL DIVIDER (Laboratory)
Slide wire resistance is used to obtain variable voltages from a fixed source of electromotive force.

P-122 MAGNETISM
Properties of bar and horseshoe magnets and the principles of magnetic induction are discussed and demonstrated.

P-123 MAGNETIC FIELDS (Colour)
Magnetic Fields around permanent magnets and the earth as a magnet are described, mapped out, and demonstrated.

P-124 WHEATSTONE BRIDGE (Laboratory)
The electrical resistance of a number of different kinds and sizes of wire is determined.

P-125 EFFECTS OF ELECTRIC CURRENTS
The heating effects and magnetic effects of electric currents are explained and demonstrated.

Call
No.

P-126 ELECTRICAL EQUIVALENT OF HEAT (Laboratory)

Electric current and voltage supplied to a standard light bulb and the heat produced by the expended electrical energy are measured. From these the electrical equivalent of heat can be calculated.

P-127 ELECTRIC MOTORS

The principles by which a magnetic field, exerting a force on a current carrying wire, are studied and demonstrated. The principles are also applied to the ammeter and voltmeter.

P-128 MAGNETIC INDUCTION

Magnetic field, in and around current carrying wires, coils, solenoids, and electromagnets are described, and methods of calculation presented.

P-129 A STUDY OF MOTORS (Laboratory)

Principles of the electric motor are described and demonstrated by actually assembling a small laboratory electric motor which operates.

P-130 INDUCED ELECTRIC CURRENTS

The principles of induced electric currents, beginning with Michael Faraday's discovery, are presented and then applied to the design of an electric generator. Alternating current is discussed along with eddy currents and Lenz's Law.

P-131 COULOMB'S LAW — MAGNETISM (Laboratory)

Specially designed magnets are used on a hibbert balance. From measured forces between magnets, the inverse square law for magnetic poles can be verified.

P-132 TRANSFORMERS

Principles of induction coils, closed and open core transformers, and the long distance transmission of electrical energy over power lines are discussed and demonstrated.

P-133 ALTERNATING CURRENT THEORY

The concepts of inductance, inductive reactance, and impedance are introduced as fundamental principles relating to alternating currents. Levitation is demonstrated with an operating levitator.

P-134 TRANSFORMERS (Laboratory)

Voltage measurements on the primary and secondary coils of a transformer are made. Coil combinations, involving step-up and step-down transformers, are used.

Call
No.

P-135 DISCOVERY OF THE ELECTRON

The general appearance of high voltage electrical discharges in partially evacuated tubes is demonstrated. Straight line propagation and momentum of cathode rays are demonstrated.

P-136 ELECTRONIC CHARGE AND MASS

The bending of cathode rays in an electric field and in a magnetic field is described and demonstrated. These experiments show that cathode rays are negatively charged particles. Millikan's oil drop experiment is described in some detail.

P-137 THE ELEMENTS AND THEIR ISOTOPES

Thomson's mass spectograph and his discovery of neon isotopes are described. Isotopes and their relative abundance are discussed.

P-138 ELECTRONIC CHARGE TO MASS RATIO (Laboratory)

A beam of electrons, from an electron gun, is bent in a magnetic field, and measurements of orbit radius, accelerating voltage, magnetic field and current are made. These are for the purpose of calculating e/m for electrons.

P-139 LIGHT SOURCES AND THEIR SPECTRA (Colour)

The four general types of spectra are described and demonstrated. These are continuous emission, continuous absorption, line emission, and line absorption spectra.

P-140 WAVE LENGTHS OF SPECTRUM LINES (Laboratory)

Using a diffraction grating the spectrum lines of mercury vapor and sodium vapor are measured. From the results the wave lengths can be calculated.

P-141 X-RAYS (Colour)

The discovery of x-rays by Roentgen and the construction and principles of x-ray tubes are discussed. The principles by which x-ray photographs are made are demonstrated.

P-142 RADIOACTIVITY

The discovery of radio-activity by Becquerei, the ionization of alpha, beta, and gamma rays are discussed. The principles of the Wilson Cloud Chamber are explained and demonstrated.

P-143 RADIOACTIVITY MEASUREMENTS (Laboratory)

The characteristic plateau curve for a Geiger-Mueller counter is determined experimentally, and measurements are made on a counting rate meter to verify the inverse square law.

Call
No.

P-144 ELECTROMAGNETIC WAVES

The layden Jar and the discovery of oscillating circuits are described and demonstrated. Electrical resonance, the propagation of electromagnetic waves, and the principles of the Tesla Coil are described and demonstrated.

P-145 VACUUM TUBES (Colour)

The historical development of wireless and radio from Marconi to the DeForest Audion is covered.

P-146 CHARACTERISTICS OF VACUUM TUBES (Laboratory)

Measurements of grid-voltage and plate current applied to the elements of a triode vacuum tube are made. From these double characteristic curves are to be plotted.

P-147 OSCILLATORS, AMPLIFIERS, AND RADIO

Electrical circuits using triode vacuum tubes as amplifiers and as oscillators are described. Simple radio transmitter and principles of a loud speaker are treated.

P-148 THE PHOTOELECTRIC EFFECT (Colour)

The phenomenon of the emission of electrons from metals, by the action of light, is demonstrated, and the explanation through the Einstein photoelectric equation is presented. Transmission of sound over a light beam is demonstrated.

P-149 ELECTROMAGNETIC WAVES (Laboratory)

WHF electromagnetic wave lengths are shown by standing waves on a conductor. Wave length of microwaves is measured by reflection from a plane surface.

P-150 RADAR AND TV

The echo effect of microwaves is described, and the use of wave guides is explained. The principles of scanning and of the image orthicon, as used in television, are presented.

P-151 GEIGER-MUELLER AND SCINTILLATION COUNTERS (Laboratory)

The counting rate capabilities of these two counters are studied. The resolution time of the Geiger-Mueller counter is determined from counting rate measurements.

P-152 THE BOHR ATOM

The Rutherford scattering experiments of alpha particles by thin metal films are described, and then demonstrated by a mechanical model. The principles of the Bohr atom of hydrogen are given.

Call
No.

P-153 ELECTRON SHELL STRUCTURE

The principles of the Bohr atom are extended to the other elements of the periodic table. Numbers of electrons in the various shells are described. The principles of the Thomson shell model are demonstrated by using small magnets floating in water.

P-154 PHOTON COLLISIONS AND ATOMIC WAVES

The photoelectric effect and Compton effect are discussed and demonstrations of the particle aspects of photons. The De-Broglie waves, as they apply to the Davisson-Germer experiment, and the hydrogen model are presented as illustrations of wave aspects of atomic particles.

P-155 ELECTRON OPTICS

Reflection of electrons in a uniform electric field is compared with the refraction of light and Snell's Law. Electron lenses of various shapes and designs are discussed and then applied to an electron gun, the oscilloscope, the infrared telescope, and the electron microscope.

P-156 NUCLEAR DISINTEGRATION

Rutherford's discovery of induced nuclear disintegration, Chadwick's discovery of the neutron, Einstein's mass energy equation, and the relations among different forms of atomic energy are described and illustrated.

P-157 COSMIC RAYS

A brief history of the early experiments in cosmic rays is given. This is followed by a discussion of the discovery of the positron, the prediction and observation of electron pair production, and a description of cosmic rays showers and the continuous Wilson Cloud Chamber.

P-158 ATOMIC ACCELERATORS (Colour)

Begins with the Cockroft-Walton experiment, then describes the cyclotron, Van de Graaff generator, betatron, and linear accelerator. A working mechanical model of a cyclotron is demonstrated.

P-159 RADIATION MEASUREMENTS (Laboratory)

The absorption of penetrating radiation by matter is described. Measurements of the absorption of beta and gamma rays, by solids, are made by means of a Geiger-Mueller counter.

Call
No.

P-160 TRANSMUTATION (Colour)

The disintegration and transmutation of atomic nuclei, produced by high energy atomic particles from typical accelerators, are described. Neutron distintegration and the discovery of mesons are discussed.

P-161 INSIDE THE NUCLEUS AND FISSION (Colour)

Binding forces between nucleons; the nuclear barrier and potential well model of nuclei; and the transuranic elements are described. A working mechanical model of a nuclear potential barrier is used to demonstrate nuclear capture of high energy particles.

P-162 NUCLEAR ENERGY (Colour)

Describes fusion of hydrogen nuclei as a source of solar energy, the chain reaction of uranium nuclei, and principles of critical mass relating to atomic bombs and nuclear power plants. The mouse-trap experiment is used to demonstrate a chain reaction and a block model to illustrate an atomic pile.

Space Age Series

S-15 ATOMIC ENERGY — INSIDE THE ATOM (Colour) 14 MINS.

In this film, several pieces of evidence are presented to suggest that the atom is not an entity in itself, but that there is something inside the atom. Simple experiments with radioactive materials including a cloud chamber demonstration, illustrate the breaking up of atoms. In animated diagrams we see the structure of an atom, establishing the concept of a central core or nucleus. The film also demonstrates that there is energy inside the atom, and shows several examples of this energy doing work.

S-14 ELECTRONS AT WORK (Colour) 14 MINS.

Presents evidence that electrons exist and that they provide energy for many different kinds of work. Simple experiments and demonstrations illustrate the characteristics of electrons, and interesting examples of electrons at work in television tubes and in electric computers are shown.

S-5 ENERGY AND WORK (Colour) 11 MINS.

Demonstrates that in science the word "work" means using energy to make something move, or to make something stop moving. Simple illustrations such as moving water, a wrecking

ball, or a bowling ball, are used to show that there is energy (kinetic) in all moving objects. Explains that energy can be stored (potential) and that potential energy is stored in many things: a wound-up rubber band, a hanging sandbag, gasoline and other fuels. Demonstrates that energy can be changed from one form to another.

S-13 EVIDENCE FOR MOLECULES AND ATOMS (Colour) 19 MINS.

This film illustrates simple and compelling evidence that atoms and molecules exist. It shows that scientists are concerned with many things they cannot see, and explains the value of circumstantial evidence in science. Simple demonstrations and laboratory experiments are used to build a case for the existence of atoms and molecules. Photomicrography, X-ray and live-action photographs are used to illustrate this important concept.

S-3 FORCES (Colour) 13 MINS.

This film shows that a force is a push or a pull, that pairs of forces can change the shape of objects, that machines make it possible to change the direction or size of a force, how an impact can transmit a force, and the effects of balanced and unbalanced forces. Familiar situations and simple demonstrations show gravitational, electrical, and nuclear forces.

S-8 HOW TO BEND LIGHT (Colour) 12 MINS.

This film introduces the concept that light can be bent by reflection and refraction. A simple demonstration shows that light travels in a straight line, and that objects can be seen because light hits them and is then reflected back to the eye. Demonstrates with the help of mirrors and prisms that light bends when it passes from one material to another, and that lenses can bend light to magnify objects or to focus images.

S-2 HOW TO MEASURE TIME (Colour) 11 MINS.

In this film, time is shown to be an important scientific concept because of the role it plays in the description of events. It demonstrates the principle that time can be measured by counting the events of a repetitive action. Shows how many devices, such as clocks, oscilloscopes, etc., use this principle to measure time, and describes the importance of measuring time in science.

S-11 HOW TO PRODUCE ELECTRIC CURRENT WITH MAGNETS (Colour) 11 MINS.

The film demonstrates that electricity and magnetism are closely related: an electric current can produce a magnetic effect, and magnets can be made to produce electric current. This basic principle is applied to electromagnets and generators, and magnets and coils are shown moving in relation to each other, producing enough electricity to light a city.

S-9 LIGHT AND COLOUR (Colour) 14 MINS.

Illustrates that white light consists of many different colours, and that colour depends on the ability of an object to absorb certain colours in light and reflect others back to the eye. Simple demonstrations and experiments show what colour is, how it is related to light, how the eye sees colour, and how colour can give information.

S-12 MAGNETIC, ELECTRIC AND GRAVITATIONAL FIELDS (Colour) 11 MINS.

This film has to do with three invisible things: magnetic, electric, and gravitational fields. Simple demonstrations show that although fields are invisible, the effects they have on objects can be observed: the effects of a magnetic field on a compass needle, of the earth's gravitational field on the moon's orbit, and of electric fields on various materials.

S-7 VIBRATIONS (Colour) 14 MINS.

The basic principle of vibrations and their importance in many areas of science is demonstrated. Shows that a vibration occurs whenever an action is repeated with a more or less regular rhythm; that sound is the result of vibration; and that every object that vibrates has a natural frequency of vibration. Stop-motion photography helps to visualize the concept that two things are needed to cause a vibration: a force that pulls the vibrating object to a center position and the natural tendency for a moving object to keep moving.

S-6 WAVES AND ENERGY (Colour) 11 MINS.

Introduces the important principle that waves can be reflected, that they take time to travel. Explains the meaning of "frequency" and "wave length" and depicts some of the ways in which waves carry information.

S-10 WHAT IS ELECTRIC CURRENT (Colour) 14 MINS.

Basic concepts about electricity, electric current, electric charges, and electric circuits. Evidence is given that electric

charges are in all materials, that there is an electric current only when electricity has a complete circuit to flow through, and that electricity can flow through a circuit in either direction.

S-1 WHAT IS SPACE? (Colour) 11 MINS.

Shows that space is everywhere, that it exists in objects that appear solid as well as in outer space, that it is not empty, and that all through space, on earth and in outer space there is movement. The concepts of space on earth and in solid materials are illustrated with familiar examples and simple demonstrations. Animated diagrams explore the concepts of size, distance, and motion in outer space.

S-4 WHAT IS UNIFORM MOTION? (Colour) 14 MINS.

Illustrates the principle that moving objects move naturally with uniform motion if no forces are acting upon it. Simple demonstrations show that when an object is moving at a constant speed in a straight line, it is moving with uniform motion, and that objects traveling with a uniform motion travel equal distances in equal time. Demonstrates the effect of friction on moving objects.

Social Studies

Africa

SS-550 LIFE IN AN OASIS (Colour) 11 MINS.

The relationship of an oasis environment to daily life is dramatically shown in this film — the irrigation farming, the building of houses of mud bricks, the constant fight against wind and sand. The film contrasts earlier, natural oases with present-day, man-made oases where modern technology is used to locate water, drill wells, build fertilizer factories, and prepare the earth for planting.

SS-551 LIFE IN ANCIENT EGYPT (Colour) 29 MINS.

Architecture, art and everyday objects have been woven together to portray the life of Ancient Egypt. Although the whole span of Egyptian civilization is referred to, the film is mainly concerned with the period known as the New Kingdom (1580 to 1090 B.C.). It has been assumed that the pupils already have been taught something of the ancient civilization and of the culture, technical achievements and lives of the people.

Asia

SS-574 THAILAND, LAND OF RICE (Colour) 14 MINS.

From the city of Bangkok — center of commerce, government, and the spiritual life of the nation — to the fertile river valley in which abundant rice crops are produced, the film presents a richly varied overview of Thailand and its people. Includes sequences on rice farming: the way of life of a typical farm family; the floating market on Bangkok canals; and the busy traffic in Bangkok harbour.

SS-575 TURKEY — A MIDDLE EAST BRIDGELAND (Colour) 18 MINS.

Travelling by bus through Turkey, two boys observe modern developments in transportation, manufacturing, reforestation projects and dams to provide water for irrigation and electric power. They also see something of the mining industry, and catch a glimpse of work on the farms. But more important is the understanding of Turkey's strategic position as a bridgeland nation between Asia and Europe.

Europe

SS-542 FRANCE AND ITS PEOPLE (Colour) 14 MINS.

The surroundings, traditions, attitudes, and ways of earning a living in a single French family reveal many facts of life in France today. The blending of an old heritage and modern ways is shown in the grandeur of historic buildings in Paris and the quiet of a Normandy farm.

SS-557 THE MEDITERRANEAN WORLD (Colour) 22 MINS.

This film shows the significance of the Mediterranean region in the development of Western civilization. The distinctive features and achievements of early civilizations are illustrated and contemporary life in the Arab countries and Greece and Italy are shown. The importance of the region as a center of world tension today is pointed out.

SS-570 SPAIN IN THE NEW WORLD (Colour) 13 MINS.

This film takes us back to a period when colonial Mexico was the brightest jewel in the Spanish crown. There are the overseers and artisans of the period, people of mixed Spanish and Indian blood . . . and the Indians who laboured in the silver mines on the vast haciendas of Spanish noblemen. There are scenes of pomp and spectacle, scenes of poverty and primitive customs, forming a rich mosaic of vivid colours and sharp contrasts . . . showing that many traditions which date back to New Spain are still a vital part of Mexico today.

Great Britain and Ireland

SS-572 STATE OPENING OF PARLIAMENT (Colour) 22 MINS.

A brief history of the development of the British Parliament to its present form is presented as background for the pageantry and tradition which is an integral part of the Opening of Parliament.

Sequences include shots of the Palace of Westminster, the House of Lords, the Assembling of Members of the Government, and finally the entrance of the Queen, who reads The Speech from the Throne.

Canada

SS-537 CITY OF GOLD 22 MINS.

A nostalgic recollection of the period when the Yukon gold fever was at its height. The commentary, written and spoken by Dawson-born Pierre Berton, begins with boyhood recollections of the writer. This feeling of retrospect is further deepened by the introduction of many vintage photographs which give the film a documentary quality as it reviews the history of the gold rush. We see relics of the old Dawson as it was when all the gold of the rich river beds flowed through its stores, taverns and dance halls.

SS-541 FACE OF THE HIGH ARCTIC (Colour) 13 MINS.

A study centered around the Queen Elizabeth Islands of the Canadian Arctic, of a geological evolution that has gone on for millions of years. Treeless wastes bear evidence of glaciers that advanced and receded, and of life forms that changed with the climate. The film exposes the cataclysmic forces that passed over this Arctic land, then retreated leaving it in cold repose.

SS-544 GEORGES P. VANIER 30 MINS.

A film profile of Canada's Governor General, viewed against a background of events in which he played a prominent part. His military service in two world wars, his diplomatic service between the wars, and his investiture as Canada's 19th Governor General, are all shown in historical context. In the film you also meet Madame Vanier as she takes over her duties as Canada's first lady.

SS-561 PEOPLE OF THE ROCK (Colour) 14 MINS.

Here is a view of the New North as the industrial clangor of the 20th century breaks upon the ancient stillness of the Arctic. Eskimos leave their families to go to work in the North Rankin Nickel Mine, learning with remarkable dexterity to operate

the bulldozer, the mucking machine, the ore locomotive and the ore drill. Through their experience at Rankin Inlet emerges Canada's plan for Eskimo integration — a future of challenge and promise.

SS-568 ROUGHNECKS (OIL DRILLERS) 22 MINS.

The life and work of an oil-drilling crew is shown from the moment they arrive with their rig to the time when the well has been successfully capped. Mud and muskeg, rain and wind — nothing halts the probing drill once the derrick is raised and the race for oil begins.

SS-538 CLIMATES OF NORTH AMERICA (Colour) 20 MINS.

Excellent map sequences are used to depict the variations in climate in the different regions of North America. The patterns of climate with their causes and influence on industry and life of the people are shown. Regions illustrated are: Greenland ice-cap; Arctic tundra; sub-Arctic; continental; sub-tropic; Pacific and desert.

Western Provinces

SS-566 ROCKY MOUNTAINS: A GEOGRAPHIC REGION (Colour) 11 MINS.

Photographed in Alaska, Canada, and the Rocky Mountain states, this film presents a geographic overview of the Rocky Mountains, one of the most spectacular features of the North American continent. A region of rich natural resources, including minerals, forests, rushing rivers, as well as grazing and agricultural lands, these mountains have played a significant role in the development of the continent.

SS-571 STAMPEDE STOPOVER (Colour) 18 MINS.

"Stampede Stopover" captures the flavor and spirit of Stampede Week, seen through the eyes of a girl from eastern Canada, whose train stops over in Calgary at the height of the festivities. The camera accompanies her as she starts a light-hearted tour of the city and is caught up in the excitement and color of the greatest western show on earth.

Ontario

SS-530 ABITIBI (Colour) 28 MINS.

Using 50-year-old black and white flashbacks, interspersed with modern colour shots, the technological advances in the lumbering industry are dramatically illustrated. The visual presentation is so self explanatory, that only five minutes of commentary is required.

SS-563 PIONEER VILLAGE (Colour) 32 MINS.

Many aspects of life as it existed in an Ontario village of pre-Confederation days are dramatically illustrated by a visit to the re-constructed village site at Black Creek. The life of the pioneer family as seen in this film is characterized by its dependence on the land, by its deep-rooted religious convictions and by its social activities.

SS-580 VILLAGE IN THE DUST (Colour) 20 MINS.

Village in the Dust is the story of the discovery of the remains of a thousand-year-old Indian village. One of Canada's most important archaeological finds, it has provided historians with a link between the Woodland tribes who roamed Canada for thousands of years and the famous Iroquois whom the first Canadian explorers encountered.

SS-582 HISTORY OF MAIL DELIVERY IN UPPER CANADA (Colour) 11 MINS.

The development of our mail delivery system in early pioneer days is shown. The various stages from courier, canoe routes, mounted carrier, stage coach, dog team, and railways with the growth of rural routes, post offices, and postage stamps are outlined.

Atlantic Regions

SS-559 MY ISLAND HOME (Colour) 15 MINS.

Prince Edward Island is sometimes known as the Garden of the Gulf. Life on the Island is viewed through the eyes of a native son, who presents the various occupations of the people, as well as showing the facilities for recreation and cultural pursuits.

SS-573 THE STOWAWAY (Colour) 15 MINS.

A story of a boy, a Bluenose schooner, and adventure at sea. This is an adventure-filled quarter-hour about a thirteen-year-old boy who stows away on his father's schooner and learns about deep-sea fishing when the vessel reaches the famous Grand Banks fishing grounds off the coast of Newfoundland.

United States and Possessions

SS-543 FRONTIER BOY OF THE EARLY MIDWEST (Colour) 16 MINS.

The film describes the everyday events of the life of a Midwest settler's family from a child's viewpoint, illustrating school and community activities as well as home life, stressing the

self-sufficiency of the early settler. Highlights of the film include a frontier school in session, showing some of the equipment and instruction techniques; an accurate picture of a frontier home and its furnishings as well as components of the surrounding community, such as a grist mill and general store; the suspense of an old-fashioned spelling bee.

SS-558 THE MISSISSIPPI RIVER (Colour) 13½ MINS.

By houseboat, we follow the historically famous "Father of Waters" which, with its tributaries, forms a vast net of waterways, linking great agricultural and industrial areas with important cities and ports. This interesting film emphasizes the importance of the Mississippi as a drainage basin for more than a third of the continent, and indicates its geographic, commercial, and historic influence on its adjacent lands.

SS-564 PLYMOUTH COLONY: THE FIRST YEAR (Colour) 16 MINS.

Scenes filmed at authentically reconstructed Plimoth Plantation at Plymouth, Massachusetts and on board the Mayflower II give a vivid, authentic quality to this re-enactment of important events during the first year of Plymouth Colony. This film tells the inspiring story of the Pilgrims' struggle with great hardship and disease, and their lasting accomplishment in establishing principles of freedom and democracy in the New World.

South and Central America

SS-534 BRAZIL: GEOGRAPHY OF SOUTH AMERICA (Colour) 14 MINS.

Brazil is a country of frontier lands and great promise. This film acquaints us with the geographic features of Brazil and shows us their relationship to such important crops as coffee, cotton, and cacao. We see a land of impenetrable jungle, fertile farmlands, gigantic plantations, rich mineral resources, thriving industry, and big cities, including a sequence on beautiful Brasilia, new capital of Brazil.

SS-536 CHILE (Colour) 20 MINS.

The story device here is to meet one boy at home with his family and then follow him to school. In school, he and three other children talk about the four major regions of the country which they either had originally come from or had recently visited: Central valley near Santiago; North Chile, and the port city of Antofagasta; Valparaiso; and Southern Chile, in-

cluding Conception. After school, we follow the same boy again through Santiago — and see some of its past, present and future.

SS-539 COUNTRIES OF THE ANDES (Colour) 11 MINS.

Colourful views of the mountains, the highlands, and the people are seen against a historical and geographical survey of Bolivia, Ecuador, Peru, and Chile. The main topographical regions are described in relationship to the resources and cultural development of these Andean nations.

SS-545 GUATEMALA — NATION OF CENTRAL AMERICA (Colour) 17 MINS.

In its variety of climate and people, Guatemala is very much like other countries of Latin America: a developing nation with a substantial part of its population living primitively, unmindful of life beyond the small upland villages.

An Indian teacher introduces us to Thomas Morales and his family. From Juan Perez, manager of a large banana plantation, we learn of an entirely different world — that of the plantation where farming is geared to profit and where all the advantages of the modern world are utilized.

SS-548 INCAS, THE (Colour) 11 MINS.

Filmed at authentic sites, and using archaeological remains and existing Peruvian Indian village life, this film presents a historical, geographical, and cultural view of the Incan civilization. Discussed are the distinctive features of the Incan government and of the economy based on agriculture and small industries and crafts.

SS-552 LIFE IN GRASSLANDS: ARGENTINE PAMPAS (Colour) 11 MINS.

With a visit to the "estancia" of Senor Molinos and his family, we become acquainted with family and community life on one of the representative grasslands of the world. We learn something of the climate and geography of the Argentine pampas, a region which produces abundant food crops, fine cattle and sheep.

SS-553 LIFE IN THE HIGH ANDES (Colour) 11 MINS.

This film shows how life in high mountain regions is affected by altitude and climate. Visiting an Indian family living in a mountain valley in Peru, we learn how farming, grazing and weaving are important to their lives. The camera shows the influences of the ancient Incan civilization and presents colourful views of market day in the village.

SS-562 PERU (Colour) 20 MINS.

The film begins with an Indian boy looking out over the Andes Mountains while tending sheep near his small village. After seeing something of village and family life, we visit other parts of the country the boy has never seen: Cuzco and the market there; Machu Picchu, the spectacular lost city of the Incas; Lima where the boy's sister and brother work; and the oil wells of the countryside.

SS-569 SOUTH AMERICA: GEOGRAPHY OF THE CONTINENT (Colour) 14 MINS.

This film acquaints us with the main geographical features of South America: The Andes, the Guiana and Brazilian highlands; and the Orinoco, Amazon, and Plata-Parana river basins. The film shows the relationships of these geographic factors to the people and their ways of life, and provides a survey of agriculture, industry, commerce, cities, and culture in South America.

Community Services

SS-581 WIRES TO OUR HOUSE (Colour) 14 MINS.

Many wires are necessary to distribute power safely throughout the house. The film explains how various wires are channels for the transmission of power and communication.

History

SS-532 BALDWIN, R. — MATTER OF PRINCIPLE 33 MINS.

A stirring reconstruction of the Upper Canada Rebellion of 1837, places emphasis on the role played by the Reform Leader. Some insight is given regarding the revolt against a corrupt government, together with the struggles and hardships endured before the final enactment of Constitutional Reform.

SS-533 BOLIVAR: SOUTH AMERICAN LIBERATOR (Colour) 11 MINS.

Authentic locales in Venezuela, Ecuador, Peru, and Colombia lend vividness and immediacy to this biography of the liberator of five South American countries and his dream of a united South America. This film explains the factors which led Simon Bolivar to abandon his fortune and position and relates his life to the development of democracy in South America.

SS-540 ENGLISH AND DUTCH COLONIZATION IN THE NEW WORLD (Colour) 11 MINS.

As the film reconstructs the beginnings of settlement in an English agricultural colony in Virginia, a Dutch trading colony in New York, and a Pilgrim colony in Massachusetts, we learn some of the basic motivations and patterns of colonization.

SS-546 HOLY ROMAN EMPIRE (Colour) 14 MINS.

Photographed in Europe in authentic locales, this film brings colour and authenticity to the thousand-year history of the Holy Roman Empire. It describes how an enormous section of western Europe was united under the idea of a single Christian government. Costumed re-enactments with dialogue dramatize the division of powers and conflict between the Popes and the Emperors and the factors which led to the eventual decay of the Empire.

SS-547 JOSEPH HOWE — TRIBUNE OF NOVA SCOTIA 32 MINS.

As editor of the Nova Scotia "Tribune", Howe waged an unceasing campaign for political reform. This film presents a re-enactment of the trial of 1835 in which he was charged with seditious libel — a courtroom drama where the trial of a courageous editor became an indictment of a government which denied fundamental liberties to the people of the colony.

SS-554 VOICE OF THE PEOPLE — LORD ELGIN 30 MINS.

This is the story of Governor General, Lord Elgin, successor to Lord Durham, who continued the fight for responsible government in the emerging Dominion of Canada. The Rebellion Losses Bill of 1849 is the focus of attention. On this Bill, Lord Elgin defended the principle that the Government has the sole right to establish and maintain the law of the land.

SS-555 LORD DURHAM 29 MINS.

Emissary of the British Parliament, Lord Durham was sent to find a solution to the political strife existent in Upper and Lower Canada. His careful assessment of the situation, together with the revolutionary proposals he advanced opened the way to self-government in Canada, although the personal cost to himself was great indeed.

SS-556 WILLIAM LYON MACKENZIE — FRIEND TO HIS COUNTRY 29 MINS.

A rebel against the governing Council of Upper Canada in the 1800's, Mackenzie was active in the campaign for responsible government. Many of the stormy incidents of his life, his most

decisive election victory and later defeat, his imprisonment and self-imposed exile, and finally his return to Canada are depicted.

SS-560 PAPINEAU: THE DEMI GOD 28 MINS.

This is a stirring picture of early Quebec during the time when Louis-Joseph Papineau represented the voice of the people in the struggle for responsible government. The incident recreated concerns Papineau's refusal to take his seat as Speaker of the Assembly, Papineau's political associates, and his adversaries appear in their respective roles in the controversy.

SS-565 PREHISTORIC MAN IN NORTHERN EUROPE 14 MINS.

This film traces the significant developments of man's way of life from the beginning of the New Stone Age through the Ages of Bronze and Iron, to the end of the prehistoric ages, marked by the introduction of a written language. With re-enactments of living conditions in regions of Northern Europe which have produced many of the artifacts we now have, the film gives insight into the early life of man.

SS-567 ROOM OF DESTINY 20 MINS.

Charlottetown was the setting for the first of the Conferences of delegates from the separate colonies of British America, leading to Confederation in 1867. Many problems had to be solved before union could be completed. A re-enactment by characters in period costumes, in the room where the Meeting was held, should help bring Canadian history alive for students.

SS-576 UNITED EMPIRE LOYALISTS (Colour) 15 MINS.

This film depicts the story of the United Empire Loyalists. It outlines the reasons for their coming to Canada; methods of transportation used; hardships suffered; help given to them by the British government; and their influence on Canadian history. Excellent map sequences show the routes followed and the early settlements established.

SS-577 UNITED NATIONS: THE CHARTER 15 MINS.

The origins and development of the basic written authority on which the United Nations functions are shown as they culminate "The Charter". The films illustrates diagrammatically the international machinery created for the operation of a world peace organization, setting out the functions of each of the separate organs which constitute the United Nations.

SS-578 UNITED NATIONS: THE GENERAL ASSEMBLY 14 MINS.

This film describes the constitution and membership of the Assembly, how votes are taken, and how its business is conducted. A visit to a session of the Assembly shows how the day-to-day work is carried on.

SS-579 UNITED NATIONS: THE TRUSTEESHIP COUNCIL AND SYSTEM 16 MINS.

The stewardship system whereby non-self-governing territories in various parts of the world are administered by the Trusteeship Council of the United Nations until such times as they are able to govern themselves, is illustrated. The Council also helps colonial territories toward economic and political independence.

Transportation and Communication

SS-531 AIRPORT IN THE JET AGE (Colour) 11 MINS.

A boy has an adventure through the reading of a book, one that takes him in a helicopter to the airport. There he checks in, boards his jet airliner and takes off. No trouble at all, it seems. But then the film takes us back to watch the scores of people who work together to make this take-off possible.

Social Studies—Primary

SS-535 CHILDREN IN AUTUMN (Colour) 11 MINS.

Jerry is working on a collection of signs of autumn with the help of his sister. They observe the gradual change from the luxuriant green of the summer to the brown and red colour of autumn. They also observe changes in the animal world. The days grow shorter and the weather becomes cooler — all of which influence life around them.

SS-549 LET'S BUILD A HOUSE (Colour) 11 MINS.

Faith, her father and Mark build a playhouse. We become aware of why they use concrete and brick for certain parts and wood for others; why they use glass for windows and iron to hold things together. The children help in the mixing, pounding, sawing and painting to the best of their seven year old ability.

Teacher Training

T-69 HICKORY STICK 28 MINS.

The maintenance of orderly atmosphere for learning in a fifth grade class is the subject of this film. The teacher is observed as she encourages and motivates members of her class while at the same time guiding and disciplining the children without a hickory stick but with firmness and authority.

T-70 MATHEMATICS AT YOUR FINGERTIPS (Colour) 28 MINS.

The Cuisenaire Method of teaching mathematics in primary grades is presented. Dr. Caleb Gattegno demonstrates, with the aid of coloured sticks, that a grade one child can quickly grasp ideas of greater than, less than, bigger, smaller. Familiarization with the sticks serves as an introduction to mathematical problems through a dynamic, interesting approach to the subject.

T-71 TEACHING MACHINES AND PROGRAMME LEARNING 29 MINS.

This film presents B. F. Skinner explaining the theory of programme learning, Arthur Lumsdaine discussing a variety of teaching machines and programme materials, and Robert Glaser discussing the implementation of such machines and materials for education.

T-72 VITAL DECISION, A (Colour) 22 MINS.

This film was produced by the Scarboro Board of Education to introduce the newer courses in the revised Secondary school programme. It shows the three streams of Business and Commerce, Arts and Science, and the Engineer, Technology and Trades programmes as they affect typical students in Scarboro schools.

WITHDRAWALS

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SS-135	Victory Parade	U.S.O.E.	1	Int. Sr.
SG-31	Wearing Away of the Land	E.B.	1	Int.
SN-78	Water Animals, Tiny	E.B.	1	Int. Sr.

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